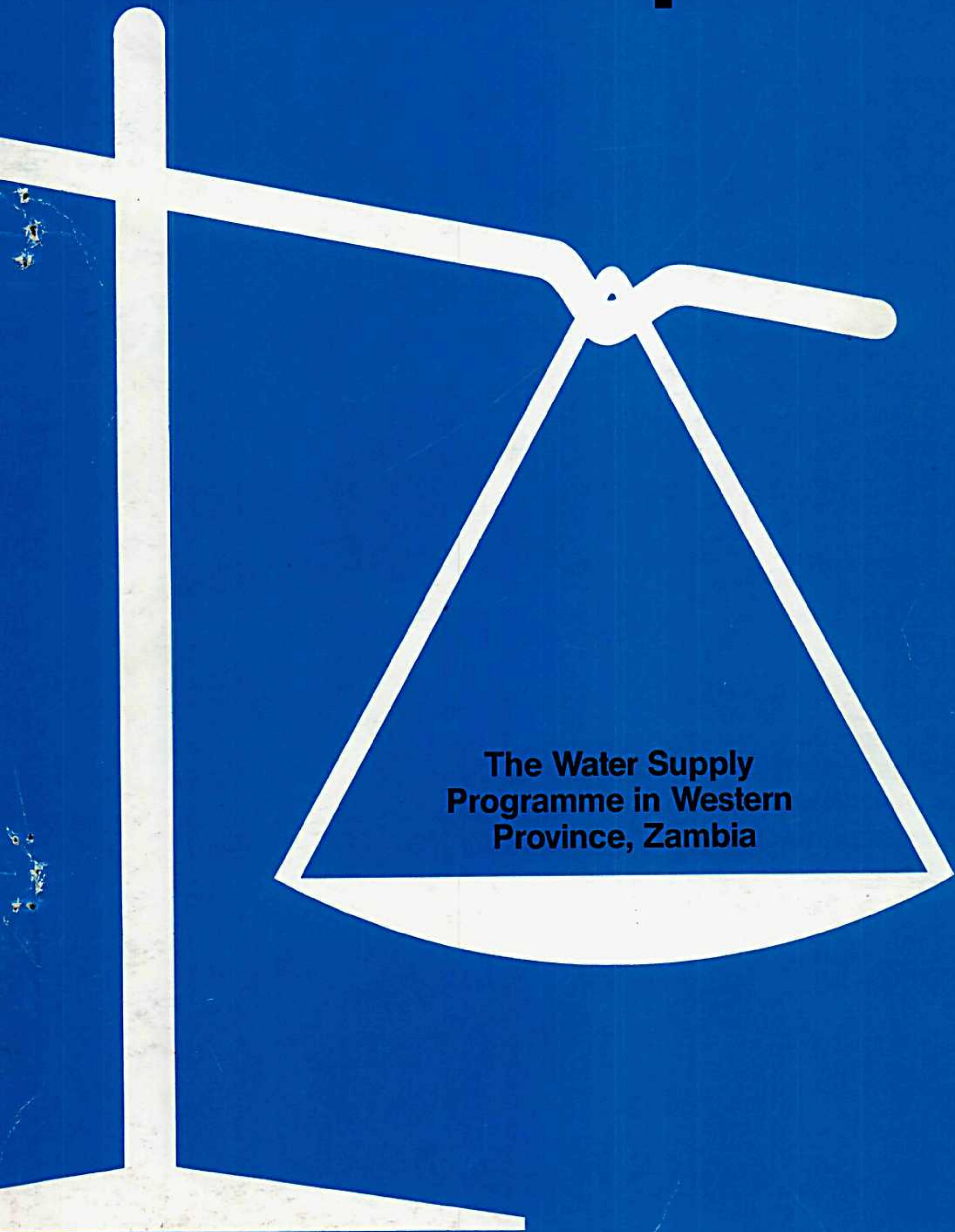




THE ROYAL NORWEGIAN MINISTRY  
OF DEVELOPMENT COOPERATION

*ADP*

# Evaluation Report 1.87



**The Water Supply  
Programme in Western  
Province, Zambia**

1. The first part of the document discusses the importance of maintaining accurate records of all transactions and activities. It emphasizes the need for transparency and accountability in financial reporting.

2. The second part of the document outlines the various methods and techniques used to collect and analyze data. It highlights the importance of using reliable sources and ensuring the accuracy of the information gathered.

3. The third part of the document discusses the challenges and limitations of data collection and analysis. It notes that while technology has advanced significantly, there are still many obstacles to overcome, such as data privacy concerns and the quality of the data itself.



# **EVALUATION OF THE WATER SUPPLY PROGRAMME IN WESTERN PROVINCE, ZAMBIA**

Report to: The Royal Norwegian  
Ministry of Development  
Cooperation

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The views expressed in this report are those of the authors and should not be attributed to the Royal Ministry of Development Cooperation.





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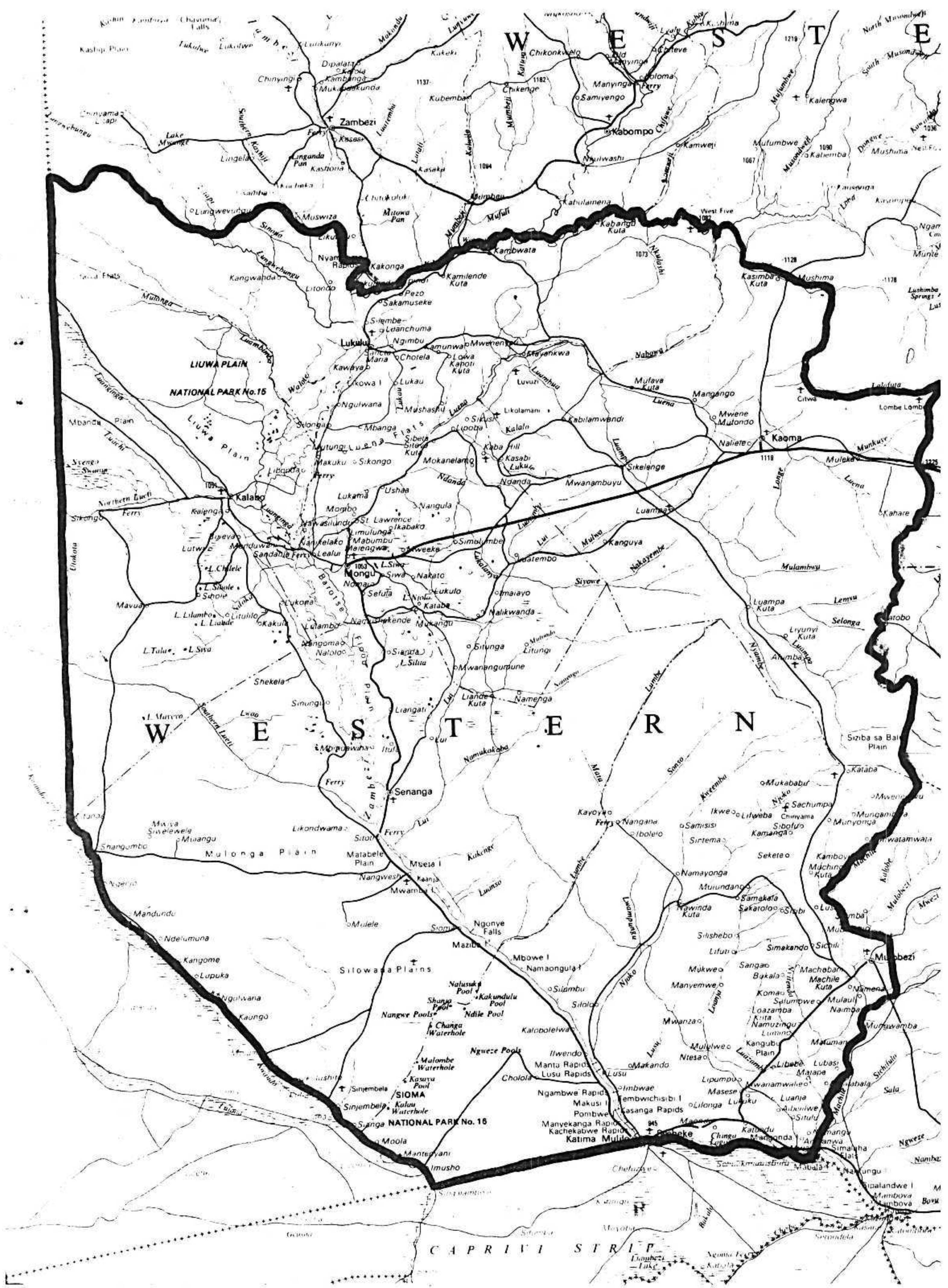
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## ABBREVIATIONS

AWE	ASSISTANT WATER ENGINEER
B.H.	BOREHOLE
CEP	COMMUNITY EDUCATION AND PARTICIPATION
CSTB	CENTRAL SUPPLY AND TENDER BOARD
D-WASHE	DISTRICT WASHE COMMITTEE
DC	DISTRICT COUNCIL
DWA	DEPARTMENT OF WATER AFFAIRS
DUH	MINISTRY OF DEVELOPMENT COOPERATION (NORWEGIAN)
GNP	GROSS NATIONAL PRODUCT
GRZ	GOVERNMENT OF ZAMBIA
H.A.	HEALTH ASSISTANT
IDWSSD	INTL. DRINKING WATER SUPPLY AND SANITATION DECADE
IWSSD	INTERNATIONAL WATER SUPPLY AND SANITATION DECADE
LWF	LUTHERAN WORLD FEDERATION
MAWD	MINISTRY OF AGRICULTURE AND WATER DEVELOPMENT
MDC	MINISTRY FOR DEVELOPMENT COOPERATION (NORWAY)
MOD	MINISTRY OF DECENTRALISATION
MOH	MINISTRY OF HEALTH
NAC	NATIONAL ACTION COMMITTEE
NCDP	NATIONAL COMMISSION FOR DEVELOPMENT PLANNING
NIVA	NORWEGIAN INSTITUTE FOR WATER RESEARCH
NOK	NORWEGIAN KRONER
NORAD	NORWEGIAN AGENCY FOR DEVELOPMENT COOPERATION
NCDP	NATIONAL COMMISSION FOR DEVELOPMENT PLANNING
ODA	OVERSEAS DEVELOPMENT ASSISTANCE
O/M	OPERATION AND MAINTENANCE
O.W.	OPEN WELL
P-WASHE	PROVINCIAL WASHE COMMITTEE
PMO	PROVINCIAL MEDICAL OFFICER
PS	PERMANENT SECRETARY
PWD	PUBLIC WORKS DEPARTMENT
PWE	PROVINCIAL WATER ENGINEER
SIDA	SWEDISH INTERNATIONAL DEVELOPMENT AUTHORITY
UNEP	UNITED NATIONS ENVIRONMENTAL PROGRAMME
UNZA	UNIVERSITY OF ZAMBIA
URTI	UPPER RESPIRATORY TRACT INFECTION
USD	US DOLLAR
UTH	UNIVERSITY TEACHING HOSPITAL, LUSAKA
WASHE	WATER, SANITATION AND HEALTH PROGRAMME
WHO	WORLD HEALTH ORGANISATION
WS	WATER SUPPLY
ZAK	ZAMBIAN KWACHA, (also K, ZK)







W E S T E

W E S T E R N

CAPRIVI STRIP

LIUWA PLAIN  
NATIONAL PARK No. 15

SIOMA  
NATIONAL PARK No. 16





# **EXECUTIVE SUMMARY OF CONCLUSIONS AND RECOMMENDATIONS**

---

The Evaluation Team was asked to assess the implementation and performance of the Western Province Water Supply Programme, and suggest strategies that might be pursued under future phases of the Programme. Since this is the first evaluation of the Programme, it covers the whole 9 year period 1977-1986. A considerable amount of work has therefore been invested in assessing the achievements in the earlier phases, in order to do justice to the Programme as of today.

The major aspects of the conclusions and the recommendations of the Evaluation Team are described below. More detailed information is presented in chapters 1 - 9. In addition, a number of the conclusions and recommendations are summarized in Chapter 10, on Future Strategy and Needs.

Since its inception, the Programme has consisted of two parallel but very different projects in terms of organisation, technology, target groups, etc., i.e. the Rural Water Supply and the Township Water Supply components. For several reasons, these two components have been treated separately in the following.

## **CONCLUSIONS**

### **Township water supplies**

The Programme addresses itself to the construction of new water supply plants in the 8 major townships in the province. The social relevance of this programme is unquestionable, since a large part of the population in the townships live in densely populated areas where the need for safe and reliable water is high.

The implementation of most of the Programme has been done using a Norwegian consultant, responsible for design and supervision, and local contractors responsible for construction.

The Programme is expected to be completed in 1988, some eight years behind the original schedule (first agreement) and three years behind the revised schedule (second agreement).

Nevertheless, progress has been acceptable, since the delays are mainly attributed to the fact that the schemes were designed to a higher supply standard than originally anticipated, at the request of Zambian authorities.

For the same reason, the cost of the township supplies has been higher than originally anticipated. In terms of investment per capita, however, the result is acceptable, and comparable with costs from similar programmes in neighbouring countries.



Despite a number of technical problems, the technology used in the Programme was found to be by and large appropriate, since it is relatively simple, inexpensive, reliable and easy to operate and maintain.

In technical terms, major problems are the Programmes neglect of the corrosiveness of the water in some of the townships and extensive leakage and wastage of water.

A sizeable part of the costs derives from the use of Norwegian consultants. It was found that these costs might have been reduced if local consultants had been used for some of the relatively simple design work required, while the Norwegian consultant might have been better utilized in more complex feasibility studies and implementation planning activities. Greater efforts might also have been made to build up design capacity within the Department of Water Affairs itself.

The Programme has succeeded in providing safe and reliable water supplies to a large number of people. A major concern, not at present included in the bilateral agreement since distribution of water is not a part of the Programme today, is the need for upgrading the distribution system with hygienic supply points, apron, run-off and soak-aways.

It was found that with relatively limited investments in sanitation and health education programmes, large benefits could thus be gained in terms of hygiene and health improvements.

Because of rapid price increases, high design standard and correspondingly high running costs, and a lack of a system for monitoring consumption and collecting water charges, there is a large gap between actual expenses and cost recovery today. Given the difficult economic situation in Zambia, there is a need for external economic support in order to keep the schemes operational in the coming years.

It was found that there is a long way to go before the actual water charges collected from different consumer groups in the townships reflect the actual quantity of water consumed. Unless this situation is rectified, future Norwegian support in operating the schemes can result in a subsidizing of the water consumption of the wealthier groups in the townships.

Under the Local Administration Act, 1980, the ownership and responsibility for operating township supplies is vested with the District Councils. In the view of this, the programme should pay more attention to preparing for a future situation where the district councils take over the responsibilities currently vested in provincial offices of centralised ministries. It should be emphasised that this is seen by the Evaluation Team as primarily a national Government responsibility and not one for the Department of Water Affairs.

## **Rural water supplies**

The Programme addresses itself to the construction of some 800 rural water supplies, as input in an overall water, sanitation, and health strategy in the province. Half of the water supplies constructed so far have been located near public institutions like schools, markets, health centers, where there is a strong need for improved water. In the earlier years, however, there was no system for identifying priority areas where there was a definite need for improved water. This problem has now been rectified, and proper selection procedures have been introduced.

Based on the limited information available to the Evaluation Team, the benefits from the Programme in terms of health impact, time saving and economic effects seem relatively insubstantial. There is little evidence for increased use of water or of improved hygiene habits. Some evidence suggests improved supplies are underutilized because of the proximity of traditional sources in areas near the Zambezi flood plain.

The rural water supply programme has suffered since its inception from a lack of feasibility studies and implementation planning. Major decisions have been left to inexperienced and unqualified expatriate personnel, and there has been a lack of adequate back-stopping and guidance of staff from DWA and NORAD in the initial years.



This resulted in a situation where the wrong technology was used to produce sub-standard water supplies in areas which were easily accessible, but not necessarily where the need for water was greatest.

For the same reasons, the Programme has become much more expensive than originally anticipated. The per capita construction costs of the Programme is correspondingly high.

When the construction phase is completed, by the end of 1989, the Programme will probably have been delayed by about 6 years, compared with the original schedule.

The major problems from previous years have been effectively addressed today. As a result of a programme review in 1984 and determined efforts by the Provincial authorities, a process of integrating the Programme in the Government structure and the intersectoral water, sanitation and health education programme in the province was started.

With the expatriate staff that are now in post, some of whom are highly qualified and experienced, with a complete change of technology, and a new approach with extensive involvement of the local communities in the development process, substantial improvements are being made.

Investigations into the hydrogeological and socio-economic situation in the province, and systematic identification of needs, which should have been done at the outset of the Programme are now being done. An implementation plan has also been drawn up for the Programme, and a system for monitoring and evaluation introduced.

If the Programme proceeds as anticipated, the production target of 800 rural water supplies should be within reach before the end of Phase IV of the Programme, in 1989.

The Programme appears likely to meet the specific targets of the UN International Drinking Water Supply and Sanitation Decade (IDWSSD) for Zambia for both township and rural water supplies. The Programme's recent achievements in reaching remote rural communities are particularly commendable and are recognised by local people.

The Programme is still in its early stages after the reorganisation and reorientation in 1984, and has not yet produced results that can be assessed in quantitative terms. An evaluation of the rural water supply programme at the present stage is therefore rather premature, and cannot do justice to the new initiatives. The results will have to be assessed underway on the basis of the monitoring and evaluation activities that have been introduced.

The Zambian Local Administration Act, 1980, calls for a future decentralisation of development activities of the kind promoted by this programme. This can only be done by extensive use of low technology approaches other than the borehole drilling used today, although in many areas in the province the geology dictates the use of drilling rigs.

For the Programme to be decentralized at a sustainable level, there is a need to develop an appropriate technology for the construction of shallow wells, and direct support to District Councils in terms of personnel and funding.

It should be noted that the Programme's organisational problems relate both to the township supplies and the rural water supply component. A major problem pertaining to both components has been the failure of the Programme to develop and prepare sufficient Zambian manpower resources to take over full responsibility for the programme.



## RECOMMENDATIONS

### Township supplies

Continued support for the operation of the township supply schemes where necessary after the construction phase is completed, should be secured from Norwegian funds.

The rationale for this is that with a minor annual input the benefits from the large investments that have been done can be realized. Otherwise, without long-term support, many of these investments will have been futile.

Future support of this kind should be given only provided that measures are taken to ensure correspondence between actual consumption of water and water charges collected from the various consumer groups.

In the coming years, a realistic decentralisation strategy should be drawn up, to guide Programme activities. The plan should include organisational changes, the need for manpower development and the channeling of funds directly to the District Councils through the relevant ministry.

The Evaluation Team recommends that a pilot project on the upgrading of domestic points, and the introduction of sanitation and health education is initiated in one of the townships. If successful, it should subsequently expand into other townships.

### Rural Water Supplies

Norwegian assistance to the present drilling programme in the province should be discontinued when the production target of 800 water supplies has been reached, unless areas have been identified where there is a need for improved water supplies which can be developed only with deep borehole drilling.

Within a 10 year perspective, the process of decentralizing the Programme should be completed. This should be done by actively promoting the District Council's capacity for constructing low-technology shallow wells in the rural areas.

An increasing proportion of Programme funds and resources should gradually be diverted into the decentralized programme under the District Councils, while at the same time personnel from provincial level are trained for operation and maintenance and transferred to the districts.

A comprehensive human resources development programme for the Programme within a decentralisation perspective should be drawn up. This should ensure that adequate recruitment, training and development is given to ensure that Zambian staff will be able to take the Programme over fully within the next 10 years.

This should include the training of personnel in Community Education and Participation to work at district level.

More attention should be given in the future to the potentials which rural water supply can have for economic development e.g. fostering agricultural and garden development.

The Norwegian support to the Programme should continue in order to support the long-term objectives which the Programme represents. In its current financial position, the Government of Zambia cannot support long-term socioeconomic objectives. It is therefore important that this is done from external sources.



# INTRODUCTION

---

## BACKGROUND TO THE EVALUATION

The water supply Programme in the Western Province was initiated in 1977, in response to a request made by the Government of Zambia (GRZ) in 1975. Project reviews were carried out by NORAD in 1982 and 1984. In 1986, after 9 years of operation it was decided to undertake a comprehensive evaluation, including an independent assessment of the implementation, performance and strategy of the Programme. The Terms of Reference of the evaluation, Appendix 1, refers.

It should be said at the outset that the Programme is an unusually complex one, incorporating a wide range of professional disciplines viz. engineering, technology, finance, economics, public health, sociology, anthropology, public administration and others. It also has to be borne in mind that the present report ranges professionally and historically over a relatively large area.

After consultation with Zambian authorities, the following Evaluation Team was appointed by the Norwegian Ministry for Development Cooperation:

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Further details are found in Appendix 2.

As part of the preparation for the evaluation, a background document based upon a review of existing documentation was prepared by Samset & Stokkeland Consulting A/S. The document contained a selection of data extracted from various documents, and was used as a main data source for the Evaluation Team, after comments had been collected from all parties involved.

Other major inputs to the evaluation were:

A review of expenditures for the Programme prepared by the Norwegian Programme Coordinator in Oslo.

- A case study on water collection and use in a rural area in Western Province undertaken by the CEP Coordinator
- A survey of functioning and utilization of the water supplies in 2 townships in Western Province, undertaken by the CEP team at the request of the Evaluation Team.
- A comprehensive list of documentation used is included at Appendix 3.

The Evaluation Team worked in Zambia in the period December 1. - 17, 1986. The work included discussions with Zambian authorities at national, provincial and district level, project staff and other individuals directly or indirectly involved with the Programme. A total of 6 township water supplies were inspected, and a number of rural water supplies were visited by the Evaluation Team. The itinerary, Appendix 4, and the list of individuals met, Appendix 5, refers.

On December 17. a meeting was held with representatives of Zambian authorities, NORAD and project personnel where the preliminary findings and recommendations of the Evaluation Team were presented and discussed.

## **ACKNOWLEDGEMENTS**

The Evaluation Team would like to express its appreciation for the helpful cooperation and good will it received from all individuals met with, and for the efforts by the project and provincial staff to provide the team with necessary information. We also wish to thank all those whose ideas and suggestions have contributed to this report. We are particularly grateful to all those in Western Province, Lusaka and Norway who gave of their valuable time to ensure that the factual basis for this Evaluation was as comprehensive as possible.



# CHAPTER 1

## PROGRAMME IMPLEMENTATION AND PROGRESS

---

### 1.1 BACKGROUND

The request from the Government of Zambia for Norwegian support to a water supply programme for Western Province is dated May, 1975. In September 1975 a NORAD delegation of three members visited Western Province for five days to do preliminary studies. The resulting pre-feasibility study recommended a limited programme based on the rehabilitation of 7 existing township water supply schemes and the construction of 700 well-points in the rural area based on the technology then employed by Department of Water Affairs (DWA).

The pre-feasibility study appears to have been the key document for the first bi-lateral Agreement between Norway and Zambia (Phase I) which was signed in July 1977.

Since its inception, the Programme has been implemented in 4 consecutive phases based upon separate bi-lateral Programme Agreements as follows:

Phase I	1977-1979
Phase II	1980-1983
Phase III	1984-1985
Phase IV	1986-1989

In the implementation of the Agreements the Ministry of Agriculture and Water Development and the Norwegian Ministry of Development Cooperation (MDC) are the responsible authorities on behalf of Zambia and Norway respectively.

### 1.2 PHASE I (1977-1979)

In the first Programme Agreement the following programme components are included:

- 7 township water supplies (Lukulu, Kalabo, Kaoma, Mongu, Namushakende, Senanga, Sesheke) including the construction of buildings and equipping of stores, offices and housing for water operators.
- A limited number of dams at suitable localities for storage and conservation of water for domestic supplies.



- Extension of the DWA workshop in Mongu. Supply of equipment and transport vehicles.
- Establishment of a training course in Mongu for water supply plant operators. Provision of necessary teaching facilities and equipment.
- Provision of housing for programme personnel during implementation.

The implementation period was set at 2-3 years i.e. completion during 1980 with a total cost of NOK 17,2 million.

The responsibility for the administration, planning, implementation, operation and maintenance (O/M) of the completed projects was vested in the Government of Republic of Zambia (GRZ).

The objectives of the Programme were stated in very general terms as:

- Development of water resources of the central and most densely populated areas of Western Province primarily for domestic consumption.
- Integration into GRZ's national development strategy with regard to water supply.

The general guiding principles for construction, maintenance and operation of public water supplies laid down by Zambian authorities are quoted in the National Action Plan for the Water and Sanitation Development Decade as follows:

- Top priority lies for development and maintenance of adequate water supply for human consumption, agriculture ...
- All Water Supply Schemes should be geared towards the benefit of the maximum number of people.
- Emphasis should be on building simple systems of water supply involving low construction and O/M costs. Where resources are limited, efforts should be made to support those most in need.
- It is highly desirable that the rural water supply schemes should be planned in consultation with the people affected by the scheme and executed with their participation.
- As a matter of principle, all costs of water supplies, construction and O/M should be borne by the respective consumer

In December 1977 a Norwegian consultant, (Østlandskonsult A/S, later called Interconsult A/S) was engaged on a contract with NORAD for the planning and design of the township water supply schemes and the surface water dams. Later (July 1981) the consultant was contracted also for the supervision of construction. Subsequently consulting contracts have been with Department of Water Affairs (DWA), rather than MDC/NORAD.

The following expatriate personnel was recruited through NORAD:

- 1 programme co-ordinator
- 1 workshop superintendent
- 2 senior mechanics
- 1 drilling superintendent
- 1 building superintendent
- 1 teaching instructor

The majority of the team arrived in Zambia in 1978. The project co-ordinator had his office in Lusaka, while the team was posted to Mongu. The field team consisted mainly of non-professional staff.



The progress of Phase I of the Programme was delayed due to several reasons e.g.:

- Lengthy negotiations with DWA concerning Terms of Reference
- Problems of the Norwegian consultant adapting to local conditions
- Difficulties in recruiting qualified Norwegian staff
- Delayed delivery of drill rigs for the rural water supply programme caused by transport and bureaucratic delays and lack of expertise in mobilising in remote parts of Africa.
- Complete lack of operational plans for the implementation of the rural water supply programme.
- Very little back-up from Norway initially for the expatriate staff.

Prior to the second Programme Agreement (Phase II) it was agreed to expand the Township Water Supply Programme according to a higher supply standard set by Zambian authorities. It was also decided to use other technological approaches than originally proposed for the rural water supply programme. This led to a very substantial increase in programme costs. This is explained in greater detail in chapter 2 below.

Up to the end of 1980, decisions regarding siting, type and number of abstraction facilities etc. were left to the drilling team. In October, 1980 a consultant was engaged for physical siting of wells and boreholes in the rural areas, based on hydrogeological investigations

### **1.3 PHASE II (1980 - 1983)**

The second bilateral Programme Agreement was signed in November 1980 and included the completion of all activities included in the Phase I Agreement, except 3 township water supplies (Senanga, Sesheke and Limulunga), which were left for Phase III. The total grant for Phase II was NOK 85 million.

It was explicitly stated that rural water supply teams should be established within the DWA organisation and that "personnel for maintenance of well-points and boreholes in the rural areas should be trained under the Programme and allocated to the Provincial Water Engineer" (PWE).

The following general objectives came in addition to those stated in the Phase I Agreement:

- The Programme should be integrated into the general social and economic development of the Western Province.
- The benefits achieved by the Programme should be spread to all social levels of the population and be enjoyed by a maximum number of people.

The Local Administration Act (1980) which had come into force, states that the District Council is responsible "To provide and maintain supplies of water, and for the purpose, to establish and maintain waterworks and mains". Nonetheless, this provision has not yet been implemented as responsibility still lies with the Provincial Authorities (except for Mongu township water supply).

#### **Progress as per end of 1983**

A workshop and a training school in Mongu and staff houses for expatriate personnel were constructed early in the period. 4 township supplies were completed: Lukulu (March 1980), Kalabo (December 1981), Namushakende



(January 1982) and Mongu (March 1983). Construction of these was done by local contractors on contract with DWA.

The first percussion drill rig started to operate in 1980. Another three lorry-mounted percussion rigs arrived in July 1981. As per end of 1983, 168 open wells and 129 boreholes had been completed. During 1983 a total of 26 wells and boreholes previously completed by the Programme were rehabilitated (deepened or re-drilled). The rural water supply teams did the technical construction only, while a driver/field worker organised communities to assist in construction of shallow wells

Three dams were completed in Kaoma District (1981) by a local contractor.

## **Reorganisation of the Programme**

A project review undertaken by NORAD in January, 1982, had recognized the need to expand the Programme to include operation and maintenance of completed schemes, to increase revenue collection and gradually integrate the Programme into the PWE administration.

In February 1984, a second project review was carried out by NORAD. The Mission made a number of recommendations which resulted in a complete revamping of the Programme:

The Programme, which was organized under DWA headquarters, was operated directly from Lusaka by the project co-ordinator, and was almost independent of PWE from the beginning. The first step towards integrating the project into DWA at Provincial level was taken in June 1984 when a Norwegian engineer with extensive experience from similar projects was engaged as Acting PWE, and officially as PWE in January 1985. The posts as Project Co-ordinator and Team leader were abolished and the responsibilities taken over by the PWE. This has proved to be a very successful solution. Also the assignment of a competent Programme Coordinator based in Oslo has greatly helped to activate developments.

During 1984, 4 open wells had been constructed with some element of community participation, while the necessary equipment, transport and supervision were provided by the project. A specific survey being part of the project review (February 1984) looked into the use of new supplies: The survey concluded that the population living along the Zambezi flood plains make insufficient use of the new supplies. Only 27 per cent use the new supply exclusively, while 42 per cent of the households living in villages provided with new supplies never use them. The villager's attitude concerning the feeling of ownership and location of wells was discouraging.

## **1.4 PHASE III (1984 - 1985)**

The third bilateral Agreement (Phase III) was signed in December 1984 and included the construction of 2 township water supplies (Kaoma and Limulunga) and about 300 boreholes and open wells. Furthermore continued support was made to operation of infrastructure facilities, consultancy services and equipment and the operation of a maintenance unit under the PWE. The total grant for Phase III was NOK 45 million.

### **Progress as per end of 1985.**

The township water supply schemes in Kaoma and Limulunga were put into operation and the borehole supply at Namushakende connected to the scheme during 1985. Additional work was also done on Lukulu and Kalabo township water supplies. A leakage detection study was initiated by the consultant in 1985 starting with Mongu.



FIG. 1.1 PROGRESS 1980-86, RURAL WATER SUPPLY

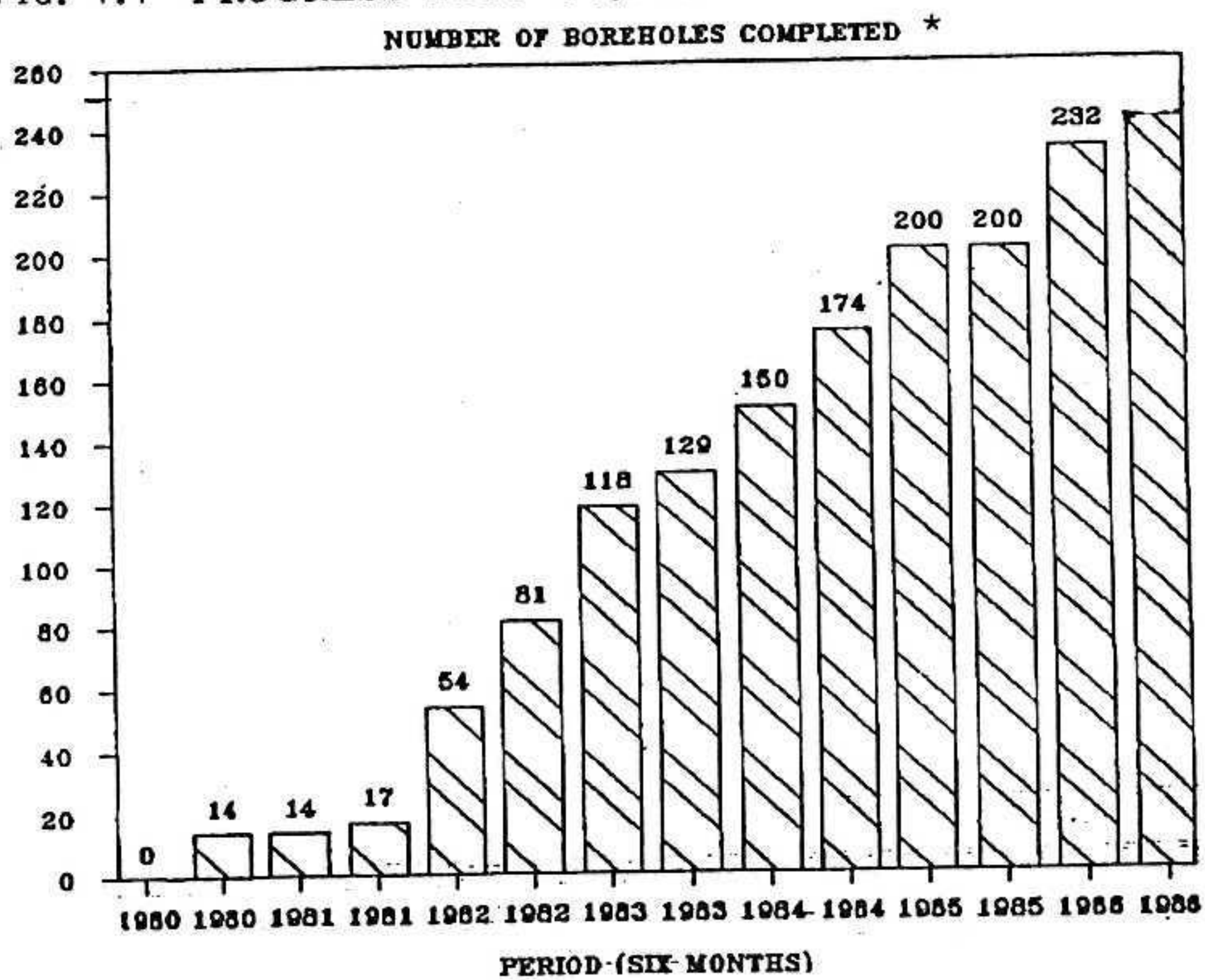
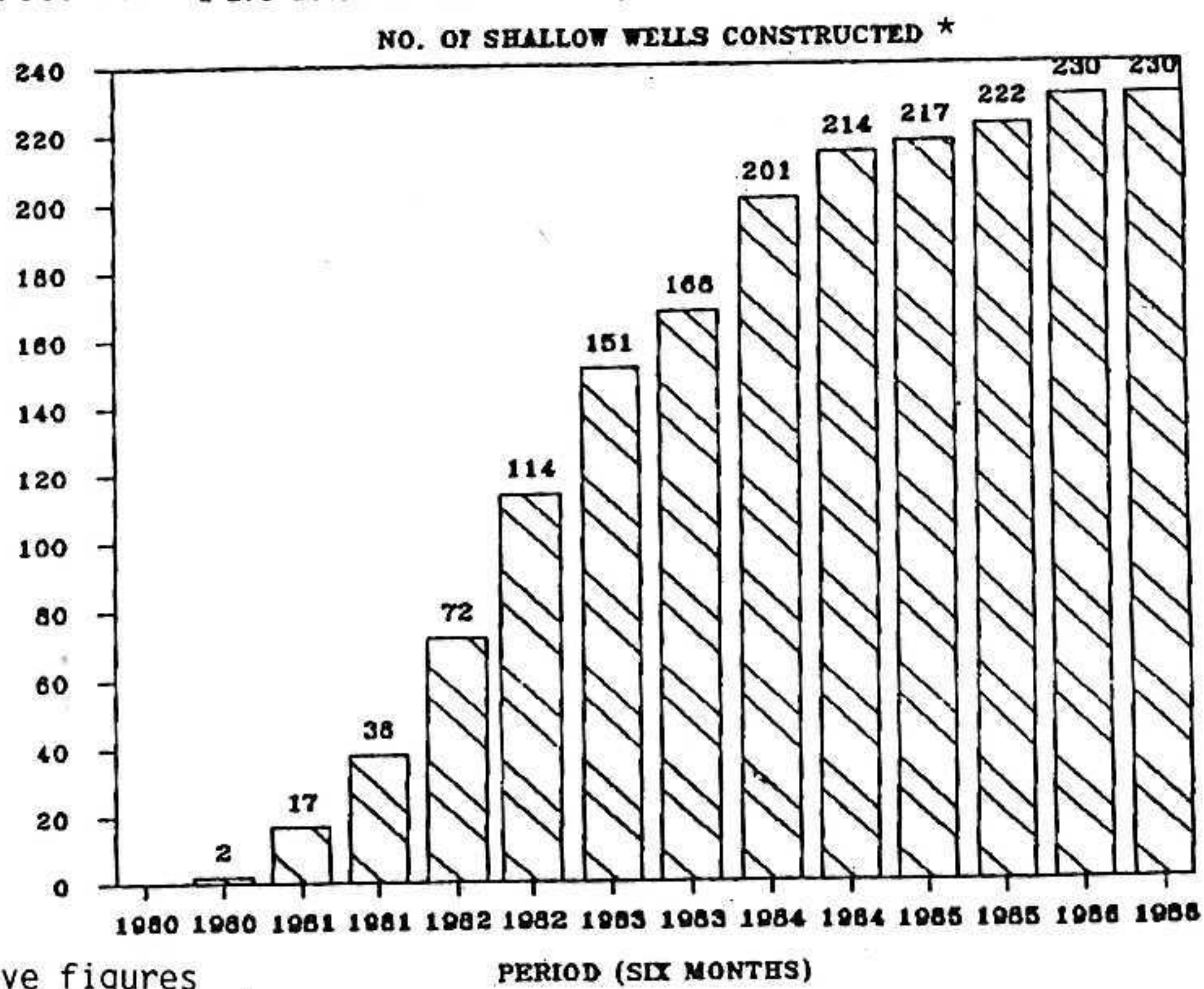


FIG. 1.2 PROGRESS 1980-86, RURAL WATER SUPPLY



\*) Cumulative figures



No siting of boreholes/open wells was carried out by the consultant in 1984 and 1985 since siting was well ahead of construction. Out of a total of 554 locations surveyed by the consultant prior to 1984, 338 were recommended for boreholes and 190 for open wells. As per end of 1985, a total of 200 boreholes and 222 open wells had been constructed. Figure 1.1 and 1.2 refer. In 1983 and 1984, 12 boreholes and 104 open wells were rehabilitated.

## **The WASHE Programme**

In January 1985, a Steering Committee was founded to coordinate activities related to water supply, sanitation and health education in Western Province, the so-called WASHE Programme. Later, attempts have been made to establish WASHE-Committees also at district level.

The WASHE Programme is an attempt to integrate and coordinate planning activities within the different sectors. The water supply programme is seen as one of several inputs within the general economic and social development plan for the province (see also chapter 8.9). Previously, it had been made clear by NORAD, that health, hygiene and community development, to enhance the effect of improved water supply, were the responsibility of the Zambian Government.

In 1985 a Health Coordinator was recruited and the process of building up a Community Education and Participation team (CEP-team) was started in April/May 1985.

## **Operation and maintenance**

A high proportion of the rural supplies required rehabilitation after only 1 to 3 years. Often breakdowns due to inappropriate technology were experienced. In 1983, and for about one year thereafter, a Landrover was equipped for maintenance of open wells, for emptying wells by pumping, removing floating objects and chlorination. For maintenance of the Township water supplies, a Landrover was equipped as a mobile workshop from mid 1985 onwards.

Two mobile workshops were delivered in 1986. The one for the township water supplies was put in operation in 1986 and the one for the two new drill rigs will be operating in 1987.

During 1985 the planning and implementation of improved O/M systems for township water supplies was introduced. It included upgrading of stand-by systems, strengthening of DWA's district offices (buildings, tools, equipment) construction of houses for DWA staff, working out O/M procedures and routines and improving revenue collection. Furthermore a reconditioned Landrover was made available for each DWA-district office.

## **Planning**

Many problems in the Programme stem from the lack of hydrogeological information, and the absence of long-term implementation plans. Apart from overall plans of operation presented in the Annexes to the Programme Agreements, more detailed short-term operational plans were revised semi-annually and included in progress reports submitted to DWA and NORAD.

Long-term planning was introduced in 1984, following the second project review. An overall plan with an 8 year perspective was presented to and accepted by both central and provincial authorities (Draft Implementation Plan, dated November 1984). The Draft Plan outlines a rural water supply programme which differs substantially from the original programme in content, time perspective and which requires inputs from different sectors.



## 1.5 PHASE IV (1986 - 1989)

The fourth bilateral Agreement includes completion of the 8 township water supplies and about 800 rural water supplies, continued operation of programme infrastructure facilities and equipping and operation of a maintenance unit under the PWE. The total grant for Phase IV is NOK 100 million, with the following tentative allocations:

Investments	NOK 42 mill
O/M	NOK 28 mill
Techn. assistance	NOK 30 mill
<hr/>	
Total	NOK 100 mill

In the Agreement emphasis is given to improved revenue collection, and recovered funds are to be earmarked for O/M. The Programme shall comply with the overall objectives of the WASHE Programme, and its objectives are:

- The Programme aims at developing the water resources of Western Province primarily for domestic consumption, and includes both urban and rural supplies of potable water.
- The Programme shall to the extent possible include community participation both in planning, implementing and maintaining water supply facilities.
- Training/education in the use of new water supplies, and the importance of water for health is to be integrated in the Water Supply Programme, and is to be offered to men and women.
- The Programme shall include Human Resources Development at all levels for the purpose of increasing self-reliance with regards to administration, execution and maintenance of water supply facilities.
- Operation and maintenance shall be taken into account in the Programme planning, both with regard to organization, training and long-term financing. The role of women shall be specifically included in the planning.
- The Programme shall be monitored and evaluated, both with regard to planned outputs from the Programme and to the overall objectives of the WASHE Programme.

### Progress as per end of 1986

The township water supply in Senanga is under construction with expected completion mid 1987. Implementation is based on direct employment of labour under supervision of the consultant, i.e. no contractor is involved. It is expected that total costs will be about 40 per cent less than costs based on implementation by contractor. During 1986 the water source for Senanga township water supply scheme was altered by DWA from surface water to ground water and then back to surface water, which caused some delay. Construction of the last township water supply scheme (Sesheke) will also be done without the use of local contractors, and will start in 1987. Completion is expected in 1988.

The first phase of the leakage detection programme for the 8 townships was completed during 1986 and repair work is at present being undertaken by DWA.

In December 1986, it was reported that a total of about 250 boreholes and 230 open wells had been constructed. Of the total 480 installations, about 260 were operational at the end of 1986. \*)

\*) In comments to the draft version of this report it is reported that at the end of January, 1987, 324 systems were operational.



The percussion rigs previously used were replaced by 2 hydraulic rotary drill rigs which arrived during 1986. It is expected that the drilling equipment now available will have the capacity to complete the Programme as scheduled in the Phase IV Agreement.

A hydrogeologist and a ground water engineer, both with long relevant experience, were employed by the project in May 1986. The engineer will function as the Head of the rural water supply section of the Programme. A complete inventory of all existing rural water supplies constructed by the Programme has been undertaken in 1986 and will form the basis for a plan of action for optimum use of the equipment which now is available for the Programme. The action plan will be integrated into the approved Implementation Plan for the Programme.

Since 1984, 6 engineering assistants have been recruited to the Programme, of which 2 have received further training in Zambia and 2 abroad (U.K. and India), in order to upgrade their qualifications to water engineers

The prospects of completing the construction of township water supply schemes within 1988 appear to be promising. By that time the infrastructure and procedures for O/M will probably be well established and qualified Zambian staff at sub-professional level (plant operators, plumbers etc.) will be able to do the day to day work at the township water supply schemes. No clear plans, however, are in hand to train or recruit technically qualified personnel at professional and sub-professional level for the districts.

A training school has been operating as a part of the Programme since 1979. For the first 5 years the school was used for training of plant operators only. Since 1984, plumbers, mechanics, bricklayers, drivers, etc. have been trained at the school. During 1986, the facilities have also been used for a number of short courses and seminars for health personnel. Except for 1983, the training school has been operating at its capacity.

The District WASHE Committees in Senanga and Lukulu are operational. Also in Kaoma the first steps have been taken for setting up a committee. The CEP-team was operational from the 1st of January 1986.

In 1985, a monitoring and evaluation system was designed for the project which will provide information about the performance and usefulness of the Programme, and is necessary for the guidance and future design of the Programme.

## **1.6 CONCLUSIONS**

### **Rural water supplies**

1. During Phase I-II (1977-84), the Programme suffered from a lack of adequate feasibility studies, coherent plans and strategies.
2. The Rural Water Supply Programme did not take off until 1981-1982 because of technical problems, inexperienced expatriate personnel, ineffective back-stopping and guidance from DWA and NORAD and late arrival of drilling rigs.
3. During the same period reporting was irregular and less than adequate for decision making. Despite obvious shortcomings of technical and administrative nature that needed urgent attention, only one project review was carried out by NORAD in the period.
4. A major reorientation of the rural water supply programme was carried out in 1984. This included an integration of the project into existing structures, major organisational changes and a complete shift of technology. A comprehensive implementation plan was introduced in 1985, to form the basis for the Programme, with a time perspective of 8 years.



5. Hydrogeological and medical expertise have been added to the project staff, and scope for health education and community involvement has been introduced in the project. Z
6. The Rural Water Supply Programme was approximately 60 per cent completed at the end of 1986 and is delayed by about 6 years compared with the original schedule.
7. Despite the fact that 30 per cent of the water supplies constructed already have been rehabilitated, only 50 per cent of the total were reported to be in operation at the end of 1986. \*)
8. Problems that remain to be solved are the establishment of a system for operation, maintenance and repair of existing facilities and development of new low-technology schemes at a decentralised level.

### **Township water supplies**

9. The start of the Township Water Supply Programme was delayed until 1979 mainly because of the consultant's lack of experience and bureaucratic procedures.
10. Major causes for delays have been problems in identifying appropriate water sources, and the fact that the Programme has been designed for a higher supply standard than originally anticipated, at the request of the Zambian authorities. After it got off the ground, the progress of the Township Water Supply Programme has been acceptable.
11. At the end of 1986, approximately 80 per cent of the Township Water Supply Programme was completed and is delayed by about 3 years compared with the original schedule.
12. A leakage detection study is being carried out at present and work has been initiated by DWA to improve the reticulation system in the townships.
13. Problems that remain to be solved by the end of Phase IV, after 1989, will be to secure human and financial resources for operation and maintenance, and upgrading of sanitary facilities and hygienic practices in the townships.

\*) Revised estimates produced by the Programme suggest that this figure was 82 per cent at the end of January 1987.





## CHAPTER 2

# TECHNICAL ASPECTS

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The two main components in the Water Supply Programme in Western Province, i.e. township supplies and rural supplies are very different in terms of complexity. In the construction of new water supply plants in township supplies where a reticulation system already exists, planning and design can be limited largely to technical and economic aspects. In the rural water supply component a number of socio-economic, cultural, hydrogeological, etc. factors are additional important determinants for success, not to mention the difficult technical question of identifying the appropriate technologies for the Programme.

According to the Programme Agreements, the Director of Water Affairs has the overall responsibility for the planning, implementation and administration of the Programme. Consequently, feasibility studies, design reports and decisions of importance should be approved by him. Because of severe shortage of professional staff, the inputs from DWA headquarters to physical planning and design have been rather limited.

During its first 6 years the Programme was marked by a lack of experience from similar projects on the part of expatriate personnel and a lack of professional advice regarding hydrogeology, technology, socio-cultural factors etc.

The follow-up and guidance from NORAD Headquarters was very limited, and during the period 1977-1986 only two project reviews were carried out (1982 and 1984). It was outside the scope of these project reviews to go much into detail on technological feasibility.

### 2.1 TOWNSHIP WATER SUPPLIES

In assessing the overall appropriateness of the technology used in the township Water Supply Programme, several factors have been considered. On the positive side, it was noted that the technology is relatively simple, inexpensive, reliable and relatively easy to operate and maintain.

Other factors of importance in assessing the appropriateness of the technological choice are the capacity of the scheme, the degree of leakage, and extent of corrosion:

#### Capacity

The first Programme Agreement visualised a very limited rehabilitation of existing water supply plants in the townships. However, as a result of requests from DWA it was decided to base the design on a higher supply standard than originally anticipated, i.e. 250 l/d for high/ medium cost houses, 100 l/d for low cost houses and 40 l/d for informal housing consumers. This was similar to standards used in larger townships in Zambia.



For comparison's sake it should be mentioned that standards in Kenya are about 30 per cent less, and the equivalent figure for high cost houses in Norway is 130 l/d. Because the design year was set at 1993, with a corresponding increase in population, the design capacity was substantially higher than initially anticipated.

## Leakage

The design of the township water supplies was based on an estimated average leakage of 13 per cent. During the past 2 years a leakage detection study has been carried out by the consultant with the following results (per cent):

Township	Leakage	Wastage	Consumption	Date
Namushakende	15	20	65	Feb. - 86
Limulunga	13	12	75	Apr. - 86
Kalabo	35	25	40	Jun. - 86
Lukulu	30	10	60	Aug. - 86
Kaoma	45	5	50	Oct. - 86
Senanga	40	10	50	Dec. - 86
Mongu	35	25	40	Feb. - 85

The pre-feasibility study (May 1977) recommended that because of the poor quality, the distribution mains in all the townships should be replaced or be improved. According to the Terms of Reference for the consultant (March 1980), the final feasibility report should include a description of the physical condition of the pipelines, an assessment of wastage and leakage and proposals for improving and upgrading existing water supply facilities. It can be argued that if more emphasis during the preliminary design stages had been put on examination of the existing distribution system as originally proposed, priority might have been on rehabilitation as a first phase rather than constructing new schemes.

The District Councils are responsible for the house connections to the distribution mains. Due to the shortage of personnel this is normally done by DWA staff. A common method is to knock a hole in the asbestos-cement pipe with a hammer/screwdriver, drill a hole in the clamp (iron) and weld a threaded pipe fitting (galvanised iron) to the clamp. This method is inappropriate and will most probably lead to extensive leakage.

## Corrosion

Of the 8 township water supplies included in the Programme, 7 were originally based on surface water. Apparently there was a general desire on the part of the Provincial Authorities and DWA to use surface water. In the designs, however, there has been an emphasis on ground water abstraction, since this alternative is less expensive (by about 15 per cent). When the township water supply Programme is completed, only 3 of the schemes will be based on surface water, the rest on borehole supplies.

Water treatment is based upon WHO's international standard for drinking water. All the townships are equipped with disinfection systems with chlorine to produce bacteriologically acceptable water. The standard does not, however, take into consideration such aspects as corrosiveness of water. The water quality data available for Kalabo, Mongu, Namushakende and Limulunga indicate that raw water in these townships is highly corrosive. There is evidence of serious corrosion attacks on asbestos-cement pipes and valves from Mongu water works after only 2-3 years of service.

Inadequate consideration has been taken to the corrosiveness of the water when selecting pipe material, valves, fittings etc. According to the Mongu well field completion report (July 1982) the pumps "have been selected to take



into consideration the possible corrosion hazard". Of the 10 boreholes in Mongu the submersible pumps in 7 of them have in fact been replaced after only 2-3 years in service. Ordering new pumps, the pumps are quoted by the supplier as "in standard execution". NIVA was consulted in May 1982 about the use of asbestos-cement pipes in the Township Water Supply Programme. NIVA indicated that given the water quality, the durability of the asbestos-cement pipes probably was poor and recommended to unearth some pipe samples for examination. This has not been done so far.

### **Operation and maintenance**

At present the responsibility for the operation and maintenance of the township water supplies is vested in DWA. The need for strengthening the operation and maintenance structure was discussed in both the two project reviews. An upgrading of DWA's district offices is currently being carried out, and procedures and routines for operation/maintenance are being worked out. A mobile workshop is now operational for such repair work that cannot be done at district level.

Day-to-day operation and maintenance of water supplies is affected by the shortage of spareparts available on the local market. Lack of standardization of equipment adds to this problem. Initiatives are now being made to standardize equipment as much as possible. Nevertheless, effective operation and maintenance of the schemes may be difficult if necessary spareparts can only be imported from abroad in the future.

## **2.2 RURAL WATER SUPPLIES**

### **Boreholes**

The first bilateral Agreement, in 1977, visualised the construction of 700 jetted well-points, a technology used by DWA at that time. The technique is said to be applicable in many parts of Western Province where there is Kalahari sand and the groundwater level is high, although this is perhaps open to question.

A well-point is a shallow borehole without casing. The technique requires very simple equipment. Because of the very fine Kalahari Sand the screen often clogs up after a relatively short period. If the sand is coarser, it will last longer - a maximum of 8 years has been recorded. The normal maintenance procedure is to pull out the assembly and re-flush it. This operation can take as little as 3-4 hours.

No well-points based on this technology have been constructed by the Programme. There is no clear-cut evidence for why no well-points were constructed despite the plan to do so. Some equipment, however, is still retained by the PWE for such work.

Instead of jetting well-points, it was decided by the first team of expatriates to drive down the casing by cable-tool rigs. Four such rigs were purchased. To reduce the risk of sand intrusion, gravel pack was provided. After installation, the 6-inch casing was extracted. The result was a well, in sand, without permanent casing. No development procedures or testing were performed. A slab was cast around the top of the riser main. Due to an unsuitable combination of materials (galvanized iron, brass, stainless steel) in addition to corrosive water, breakdowns occurred after a relatively short time in service. Approximately 50 of these wells cannot be maintained nor repaired and are therefore total write-offs.

After the arrival of new expatriate personnel, the borehole design was altered (mid-1983). The casing used during drilling was changed from 6 inch to 8 inch leaving space for a 4 inch permanent casing. Due to an earlier bulk purchase of 2-inch screens, these were still used and a special PVC-adaptor was fitted between the screen and the PVC-casing.



Problems were experienced during drilling of the 8-inch casing. Furthermore the extraction of the casing was a tedious process. To add to this it is reported that due to the small diameter of the screen it was difficult to develop the well and that the PVC casing used was of inferior quality for water well construction purposes. From mid-1985 and onwards, 4-inch PVC-screens have been used.

The cable-tool method has been used more or less exclusively by DWA throughout Zambia for a long period of time. According to the Drilling Superintendent of the RWS team one of the four cable-tool rigs are very well suited for the conditions in Western Province with 8- inch casing. The three others (AXBE-1) are too small for driving of 8-inch casing but when using special tool bits, the performance is acceptable. The method is slow with a capacity of 10-12 wells per rig per year.

An assessment of problems related to hydrogeology, well drilling technique, equipment and procedures used in the Programme, was carried out in April/May 1985 by Norconsult. It concluded that the equipment chosen and deployed by the Programme had been inappropriate, undersized and largely operated by non-professional personnel. In addition the AXBE-1 rigs are much too small for the high-friction Kalahari sands and silts encountered in the Western Province and the equipment cannot be used in some rocky areas of the Province.

In his assessment the consultant also points to the very low levels of productivity achieved by the existing 4 drilling rigs. He suggested a more versatile and flexible type of equipment which would be able to achieve much higher rates of productivity. As the consultants Terms of Reference required that he examine the possibility of using rotary drill equipment, this was considered in his proposals. The conclusions were favourable to rotary drilling rigs given the predominant geology in Western Province with fine grain sands. One of the rigs that was suggested is equipped so that it can be switched over to air percussion drilling when hard formations are encountered.

Following this assessment, two hydraulic rotary drillrigs were ordered. The smallest one (Knebel HY-79) was operational in January 1986 and the biggest one (Knebel HY 76) in June 1986. The big one is one of the most sophisticated rigs for water supplies on the market.

To compare the appropriateness of the old and new equipment is premature. Such a comparison would require a comprehensive physical plan of implementation based on the hydrogeology of Western Province and the actual location of villages to be supplied. Such a plan does not exist at the moment, although it is in preparation.

During 1986, a complete inventory of the existing rural water supplies has been worked out. The inventory will form the basis for such a plan which is under preparation and is expected to be completed during 1987.

However, the vast difference in productivity of the percussion and rotary drilling rigs is demonstrated in the table below. About the same total meterage was drilled by the 3 cable-tool rigs during a seven months period in 1984 as the small rotary drill rig during a 3.5 month period in 1986.

	Cable-tool rigs	Rotary rig HY 79
Total recorded working days	407	86
Total meterage	764	818
Total number of boreholes	38	33
Average depth (m)	21	25
Average completion time (days)	11	2,6

The versatility of the equipment available in the Province at present for rural water supply development is very



large, as demonstrated below. In addition to the two drilling rigs and one percussion rig, equipment for jetting of well points is presently available.

Model	Knebel HY 79	Knebel HY 76	Dando Percussion
Type	Hydraulic rotary	Hydraulic rotary	Cable tool
Approx. depth limit with 8-inch casing	60-70 m Sands, lightly	150 m Sands →	15-20 m Uncemented
Geology	cemented Silts + sands	hard rock	sands

### Shallow wells

During the period 1980-1986, 230 hand dug wells were constructed in addition to about 250 boreholes. These were constructed with concrete rings in series to a depth of up to 2 meters below ground-water level. The wells were capped with a concrete slab, and the hole for the bucket was provided with a wooden lid. The bucket is raised and lowered on a windlass and chain. A concrete slab with a soakaway is provided to reduce the risk of pollution.

Too shallow construction and silting has been a major problem. Numerous attempts have been made since 1983 to rehabilitate or deepen wells that are running dry. This has not been entirely successful, and the main problem with excavated shallow wells still seems to be linked to sand invasion and the subsequent loss of the water column. On the basis of an inventory recently established by the programme staff, it appeared that the water column for all wells where records exist has been reduced since construction, usually by 1,5 - 2,0 meters.

Because of these problems the excavation of shallow wells has been discontinued altogether in 1986. It has been indicated, however, that attempts will be made to find a solution to the problem of silting and search for alternative well technology which will allow for the construction of low cost shallow wells.

## 2.3 CONCLUSIONS

1. No basic guiding principles for technological development in the Programme were set out at the beginning of the Programme and no emphasis was put on labour-intensive solutions with a low foreign exchange component.
2. Choice of technology was therefore in practice largely left to the consultant in the case of the township supplies and to the individual experts in the case of the rural water supply component.

### Township water supplies

3. The capacity (and cost) of the township water supplies is higher than originally anticipated, because of high design standards for water consumption introduced by the authorities.
4. The technology used is by and large appropriate in terms of complexity, costs, reliability, operation and maintenance requirements.



5. The poor quality of the existing reticulation systems in the townships was not sufficiently appreciated when the water supply systems were designed. In technical terms, main problems with the township supplies today is to reduce leakage and wastage in the reticulation systems, and the problem of corrosion caused by acidic ground water.
6. Also the corrosiveness of the water in Western Province has been seriously neglected by the Programme. As a result there is evidence of extensive corrosion on valves, pumps and pipes after only 2-3 years in service.

### **Rural water supplies**

7. The Rural Water Supply Programme has failed during the initial 5-7 years to find technologies appropriate in the Western Province. This is because of inexperienced (and unqualified) expatriate staff and a lack of comprehension of the problems faced as a result of the geological conditions in Western Province.
8. Most of the boreholes and wells constructed to 1983 have proved to be write-offs because of a lack of appreciation of the hydrogeology, corrosiveness of the water and the properties of the Kalahari sand.
9. Attempts have now been made to rectify this situation by adopting more flexible drilling rigs. It is still too early to assess the appropriateness of such equipment in Western Province.

# CHAPTER 3

## ORGANISATIONAL ASPECTS

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### 3.1 INTEGRATION OF THE PROGRAMME

The Western Province Water Supply Programme has, to a large extent, been autonomous of GRZ control at national level, district level and community level. In the past the Programme has operated outside the administrative, financial and technical structures of GRZ. The real shift towards GRZ control and integration was initiated in 1985 after the appointment of a NORAD-recruited engineer with dual responsibility of Provincial Water Engineer, and overall field coordinator of the MDC/NORAD-supported Water Supply Programme.

The Programme has had in the past an establishment of about 160 workers who were not administratively responsible to, or integrated into the Provincial Water Engineer's office. However, it is noted that since last quarter of 1986, all personnel matters are now administered by GRZ through the Provincial Water Engineer, who in turn delegates this responsibility to the Senior Executive Officer in the Department of Water Affairs.

In the earlier phases of the project, and until the 1984/85 reorganisation, there was very little involvement of the beneficiary community in the project activities - in planning, implementation and operation of facilities. However, this aspect has improved with the introduction of the WASHE Programme and CEP component into the Programme (chapter 8 below, refers). Nonetheless, the district level leadership (two district governors) still felt that there was inadequate consultation and involvement of Party and Government leaders at district and ward levels. It was felt that most of the planning is done at provincial level and, so far, very little planning has been done jointly with district and ward levels leadership.

The integration of the Norwegian-supported water supply project into the provincial Water, Sanitation and Health Education (WASHE) Programme has considerably improved intersectoral interaction between provincial authorities. For the first time, since the start of the Programme, other provincial authorities have a basis for positively influencing the direction of the Water Supply Programme. Though the WASHE Programme is not as strong or as well organised at district level, the foundation has been laid for establishing intersectoral interaction and coordination even at the district and ward levels. In due time this is certainly going to improve the image of the Programme as more and more people begin to feel they are part of the Programme, either as administrators, advisers or beneficiaries. The Water Supply Programme would begin to be seen more and more as a GRZ programme.

In the earlier phases of the Programme, and to some extent even at present, there was no properly established institutional framework for operation and maintenance of installed facilities. This is particularly true with respect to rural water supply, where a larger percentage of wells and boreholes constructed in the earlier phases are poorly maintained and are in need of rehabilitation. This has come about as a combination of several factors. In particular, it is because the project was operating primarily outside GRZ system. Due to lack of joint planning with provincial and district authorities who have the mandate to operate and maintain the facilities, the district councils have not



budgeted for O/M. The councils must have full knowledge of the developments in their areas of jurisdiction before they can include O/M in their budgets.

The Community Education and Participation (CEP) component of the Water Supply Programme has gained a lot of momentum since the appointment of a Health Coordinator. The scope of work and activities of the CEP team has made the water supply Programme an important component of overall social and economic development in Western Province. Though the terms of reference of the CEP team include "coordination between PMO and PWE's office concerning all aspects of community education and participation ...", the Provincial Health Education office in the PMO's office does not appear to have been actively consulted or jointly involved in the planning and implementation of CEP activities. There is a danger, therefore, that CEP activities on the Programme may be running parallel to, and unintegrated into GRZ system, particularly the primary health care activities.

Though the Water Supply Programme contributes more than 90 per cent of capital and recurrent costs of water supply in the Western Province, a large proportion of the funds are disbursed by MDC/NORAD outside the GRZ financial control procedures. Since NORAD procurement procedures have been less bureaucratic than GRZ, there has been relatively higher efficiency in procurement of goods and services for the Programme. Though higher efficiency is commendable and acceptable, unfortunately the GRZ system has not developed the necessary financial capability to handle all financial transactions of the Programme. Thus in the event of continuation of MDC/NORAD assistance, but without the technical assistance, no local capacity to handle the financial aspects of the Programme exists in GRZ.

## 3.2 PERSONNEL

The Programme has had a rather high percentage of expatriate staff even in relatively minor technical positions. This has caused some resentment among the few Zambians who have felt, or assumed, that they are better qualified and deserve better treatment.

The present manpower strength on the water supply Programme will be largely redundant when the Programme comes to an end. However, a significant percentage will still be required. At present the majority of the project staff has no job security. For those that can be integrated into the GRZ civil service no major efforts have been made yet to create the necessary establishment positions in the PWE office.

The Programme has had very few Zambians in professional and sub-professional levels of responsibility. There has been too little effort to encourage and develop this category of staff in the early phases of the Programme. At present the situation has improved, and two Zambian professionals and six sub-professionals are employed by DWA at provincial level, and two by the consultant. Since 1984, a programme for overseas training of staff has been initiated.

Lately a system of "counterpart staff" has been instituted, but so far it does not seem to be well defined. Some so-called counterparts are either too junior or not adequately qualified to merit such a status. Except for the counterpart to the Provincial Water Engineer, all other counterparts are, as a matter of fact, members of a team put together to undertake specific activities.

Most of the Zambian counterparts interviewed complained that there is no formalised system of on-the-job training. Their responsibilities are not clearly specified, and they have no written obligation to be counterpart or to require the MDC/NORAD expatriates to carry out on-the-job training. As a result, the Zambians do not have full knowledge of their responsibilities, the budgets, and programme activities they are expected to administer. Although included in their job descriptions, some of the expatriate staff apparently have not understood their role as trainers/educators in the programme.



There is no unanimity whether Zambians in the PWE office are able to sufficiently manage the project if the MDC/NORAD-recruited personnel were discontinued now. Some Zambians felt that they are not adequately prepared to take over the responsibility. Even a Zambian PWE would probably find it extremely difficult to manage the project, more especially from a point of view of inter- personal relationships and knowledge of MDC/NORAD budgets, procedures and foreign suppliers.

### 3.3 CONCLUSIONS

1. Although considerable achievements have been made during Phase IV of the Programme towards integration of activities into the Government structure, this is still far from being satisfactory. A very large component of the Programme activities is still controlled financially and administratively outside the GRZ framework.
2. The Programme has suffered from inadequate consultation and joint planning between the centralised ministries in Lusaka and the Provincial and district authorities. Misunderstandings and delays in project implementation, and inadequate provisions for operation and maintenance have resulted.
3. Through the WASHE Programme the water supply Programme has now a reasonable basis for better integration with related components of sanitation, health education and community participation. However, more needs to be done to integrate it with the primary health care programme at provincial, district and ward level.
4. As a result of operating outside the rather bureaucratic GRZ financial control, the Programme has been relatively efficient in procurement of goods and services needed for the Programme. However, this has created greater dependency on MDC/NORAD and has not helped develop the necessary Zambian capacity to financially manage the Programme.
5. A serious weakness in the early phases of the Programme has been the failure to recruit and train sufficient Zambian staff particularly at professional levels. There is also no clearly defined human resources development programme. The present Zambian staff at professional and sub-professional level is still too few and inadequately prepared to take over the running of the Programme.

### 3.4 RECOMMENDATIONS

1. The integration of the MDC/NORAD-assisted water supply Programme into GRZ system, which started in 1985, should continue. However, it must be objectively defined with respect to administrative and financial control. Careful consideration must be given to the trade-off between the requirements of efficiency, under a semi-autonomous programme, and the need for financial and administrative control by Government.
2. In line with the current decentralisation policy in Zambia, financial/administrative control of the Programme should shift gradually from national to provincial and district authorities at a pace commensurate with the rate of implementation of the decentralisation policy.
3. In future, negotiations between GRZ and Norway regarding the Western Province Water Supply Programme should be constituted of Provincial planning authorities, the National Commission for Development Planning and the Department of Water Affairs. Furthermore, the Agreement must be approved by the provincial council and countersigned by the provincial Permanent Secretary on behalf of the Province.



4. Extensive consultations and joint programming between provincial and district authorities and centralised technical ministries should be instituted to facilitate smooth implementation and operation and maintenance of the Water Supply Programme.
5. In order to improve the Zambian capacity to manage the Programme, MDC/NORAD should allocate more funds from the Programme budget towards human resources development. To this effect, therefore, it is recommended that a consultant should be engaged to draw up a comprehensive human resources development programme. Such a programme should include recruitment, financing of certain local costs, on-the-job training and formal training of Zambians both within and outside the country.
6. Zambia must prepare for the eventual take over of all Programme activities by creating establishment positions for the category of staff who will be retained in the civil service at the completion of the Programme. At present these establishment positions may be funded directly from the Programme budget.

## CHAPTER 4

### ECONOMIC ASPECTS

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#### 4.1 THE OVERALL COSTS OF THE PROGRAMME

The costs incurred by the Programme are of two types. There are those costs incurred by the Government of Zambia, and those incurred under the various Agreements between the Governments of Zambia and Norway. These are known as the "NORAD grant".

Until 1977 and the advent of the Programme, the annual expenditures of the Department of Water Affairs in the Western Province were at a relatively low level as was the level of activity. After the introduction of the Programme, the level of activity and expenditures have increased rapidly. There has been no corresponding increase in available Government recurrent expenditures and counterpart funds for the Programme.

The funds available from the NORAD grant have risen dramatically since 1977. To-day's situation is that MDC/NORAD contributes about NOK 30 million per annum to water development in Western Province (This corresponds with ZK 4-7 million before 1985 and about ZK 48 million at December 1986 exchange rate). The Government through its capital and recurrent allocations to the Western Province Department of Water Affairs contributes no more than about ZK 200,000 plus salary costs ZK 300,000 per year.

In connection with this Evaluation, a comprehensive set of cost data for the NORAD grant component of the Programme was compiled by NORAD's Programme Coordinator. The data are extracted from MDC/NORAD's internal files and from a number of other sources. In some cases where data has proved to be incomplete, certain approximations have had to be made. These data have proved essential for the Team's evaluation work.

Previously such data has only really been available to NORAD personnel in Norway who have access to MDC/NORAD's detailed programme accounts. This situation has now been rectified through the regular reporting procedures of NORAD's Programme Co-ordinator.

The general lack of information to GRZ staff on the Programme costs and expenditures has been a cause of some contention in the past, and will be referred to later.

Some NOK 247.2 million in current prices or ZAK 395 million (at December 1986 exchange rates) have been allocated to the Programme under the four Agreements as follows (NOK million):

Phase I	(1977-1979) :	17.2
Phase II	(1980-1983) :	85.0
Phase III	(1984-1985) :	45.0
Phase IV	(1986-1989) :	100.0



An additional NOK 19.6 million has been made available to the Programme outside the framework of the formal Agreements bringing the total of external funds available to the Programme to NOK 266.8 million.

A total of NOK 197.3 million ( at current prices) has been expended on the Programme since its inception in July 1977 to mid 1986. This thus represents about 74% of the total planned expenditure between 1977 and 1989 and some NOK 69.4 million remains to be spent in the three years, 1987, 1988 and 1989.

## 4.2 COST STRUCTURE

For the sake of consistency the Programme costs prepared by the Programme Co-ordinator have been converted from current prices to fixed 1986 prices by applying an assumed annual inflation rate of 8% per annum. This permits a greater degree of comparison between different Programme years and different cost components. If this is done, then the cost of the Programme to mid 1986 in 1986 prices is NOK 255.8 million. The structure of costs has been as follows:

	(NOK million)	Percentage
Consultants	41.8	16 %
Experts	24.6	10 %
Township Construction	85.9	34 %
Other Investments	49.0	19 %
PWE Labour	18.6	7 %
PWE Transport	23.3	9 %
O & M Miscellaneous	12.6	5 %
<b>Total:</b>	<b>255.8</b>	<b>100 %</b>

About 26% of the total programme expenditures have consisted of Norwegian technical assistance and consulting services and this represents a direct "overhead" of 35% on all other Programme expenditures. 26% of the costs of the Township Supplies were used on consultants. On the Rural Water Supply Programme 8% of the costs were used on consultants and 15% on Experts.

The table below sets out the costs (in 1986 prices) of Other Investments, PWE Labour and PWE Transport to date.

	NOK million
Other Investments	49.0
– Housing/buildings	7.7
– Vehicles	12.2
– Workshop Equipment	5.0
– Drilling Equipment	12.6
– Pumps/Well Materials	7.4
– Miscellaneous	4.1
PWE Labour	18.6
PWE Transport	23.3

The high transport costs involved in the Programme become very apparent here with something like NOK 35 million having been spent on vehicles and transport. This represents almost 14% of the total Programme expenditures to date.

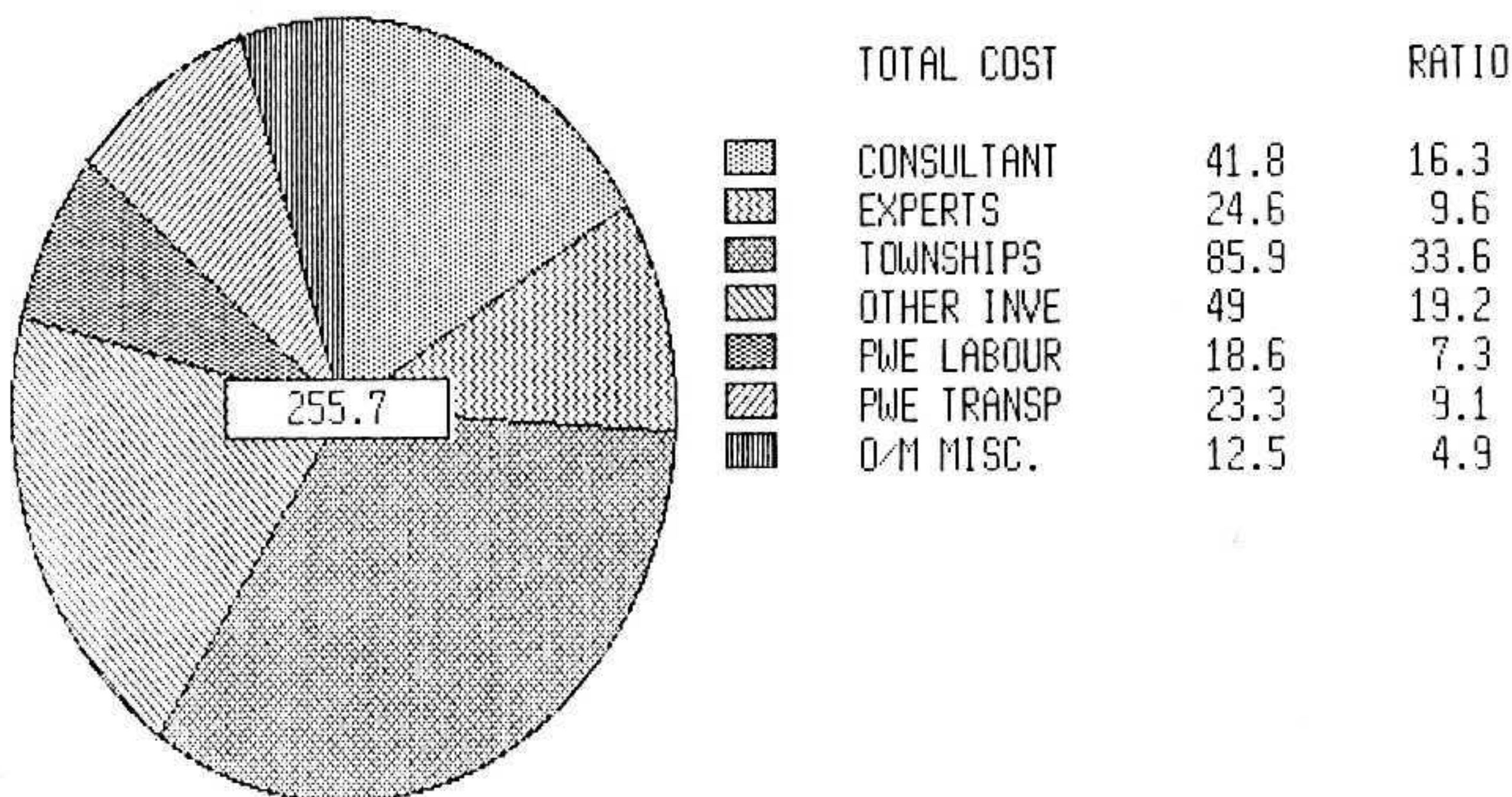
To date some NOK 124,9 million (in 1986 prices) has been spent on the Township Supplies. This represents about 48% of the total Programme expenditure. The following is the cost structure of the Township Supplies thus far:

Consultants :	26 %
Experts :	1 %
Construction :	69 %
PWE Transport :	4 %

To date some NOK 82,1 million (in 1986 prices) has been spent on the Rural Water Supply component of the Programme. This represents about 32% of the total Programme cost. The following is the cost structure of the Rural Water Supply Programme so far:

Consultants :	8 %
Experts :	15 %
Pump/well Materials :	8 %
Drilling Equipment :	15 %
PWE Labour :	19 %
PWE Transport :	35 %

Further reference is made to Figure 4.1, below.





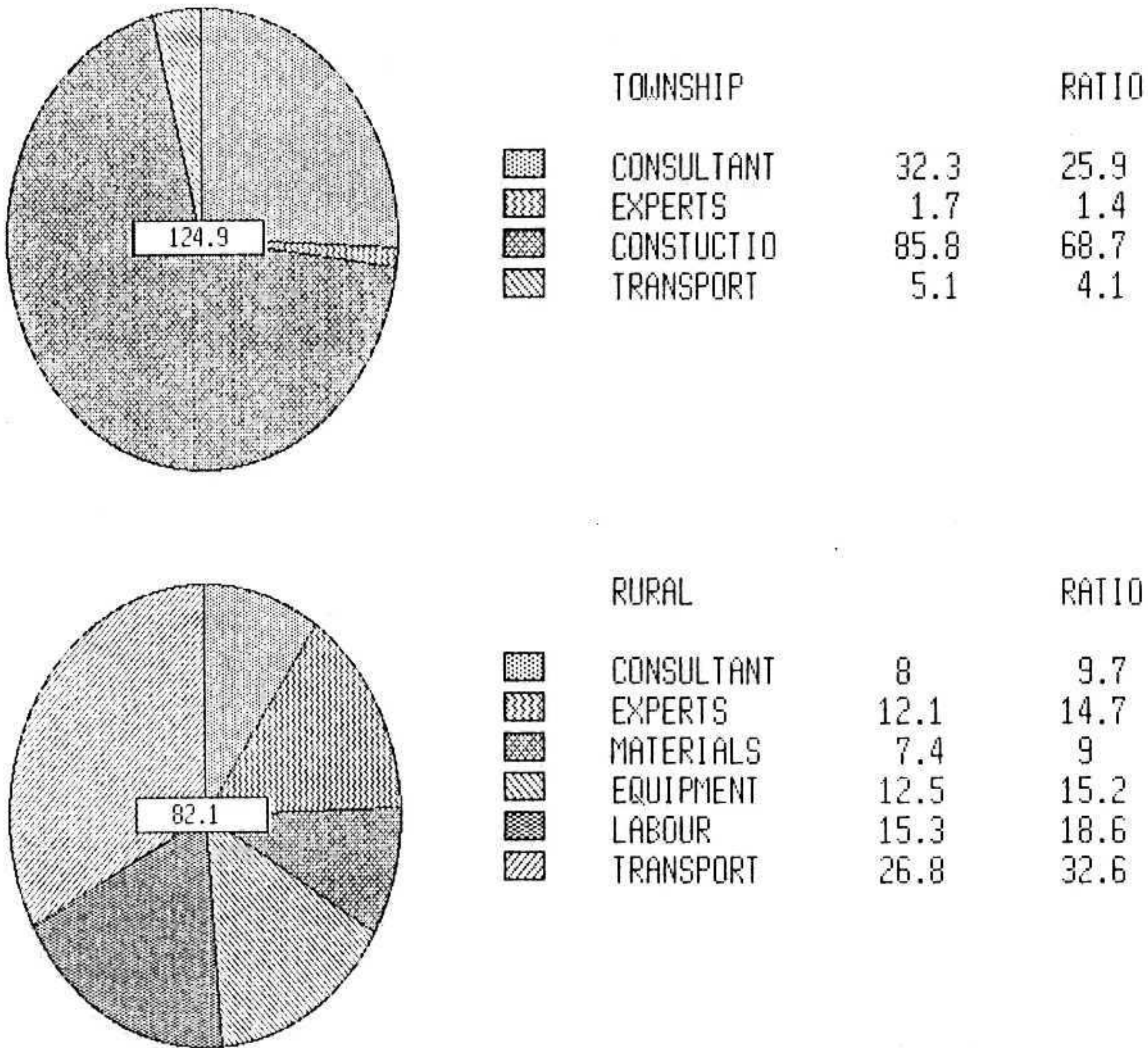


FIG. 4.1 Breakdown of Programme costs

### 4.3 CONSTRUCTION COSTS

Although it is clearly hazardous to over-simplify the costs of the Programme, it is useful to try to derive some notion of the cost per beneficiary of the Programme. Without such a notion and without some yardstick of comparison it becomes extremely difficult to evaluate the efficiency and the effectiveness of the Programme's performance. The figures below should therefore be treated with some caution.

#### Township supplies

The additional population served by the township supplies in 1995 is expected to amount to some 90,000 persons assuming a design population of 135,000 persons. As some NOK 135 million will have been spent to achieve this, the estimated cost per beneficiary of the township supplies will have been NOK 1,500.



With the data available it is not very meaningful to break the costs per beneficiary down by individual township. These will vary considerably from town to town. They are likely to be as high as NOK 3,000 per beneficiary in Namushakende and as low as NOK 500 per beneficiary in Senanga and Sesheke where direct construction supervision by the consultant has achieved substantial savings.

The Plan of Action for Water Supply and Sanitation prepared by the National Action Committee for the International Drinking Water Supply and Sanitation Decade for Zambia shows that the average per capita cost for supplying urban water in small urban townships (SUTS) in 1984 prices will be around ZK 300 i.e. NOK 1,200 in 1984 prices and exchange rates. The cost per beneficiary in the six townships already constructed would not therefore appear to be unduly high.

## **Rural supplies**

In terms of the rural water supplies, both the production rate and the success rate has been low in the early years of the Programme.

As of 1986 no more than 251 wells/boreholes that had been constructed were thought to be functioning. With a total expenditure to mid 1986 of NOK 82 million, the average cost per well or borehole amounted to about NOK 320,000 per well/borehole (or over NOK 2,000 per person served).

In the implementation plan for Phase IV of the Programme, however, provisions have been made for the rehabilitation of 250 of the existing schemes and the construction of new ones in order to produce some 900 technically functioning wells and boreholes by the end of 1989. It is estimated that the total cost will be NOK 106.2 million. The cost per well or borehole will therefore be NOK 118,000 (or about NOK 800 per person).

The reduction of the overall unit price by NOK 200,000 per borehole/well is, if it proves realistic, a result of the rehabilitation programme plus the reduced production costs for new wells.

The average cost for the wells which are presently constructed is estimated by Programme staff at NOK 64,000. This represents a considerable reduction in cost over previous practice and is possible due to the efficient new drilling methods and to the reduction in the number of expert staff which seems to have been high during the earlier stages of the Rural Water Supply Programme. It is estimated that this well can serve some 150 persons, which gives a unit development cost of some NOK 430 (this includes the cost of expert assistance).

A very rough estimate has been made by the NORAD Programme Co-ordinator that about 100,000, or less than one quarter of the rural population of Western Province had access to a satisfactory water supply before 1980. It is confidently expected that some 230,000 persons or just 50% of the rural population in 1990 will have access to a satisfactory water supply because of the Programme. This implies that the Programme will have had some 130,000 beneficiaries by 1990 at a total cost of NOK 106.2 million. This indicates an average unit cost of the rural water supply component of the Programme as NOK 800 per beneficiary.

## **4.4 OPERATION AND MAINTENANCE COSTS**

Reliable data for operation and maintenance costs for the township water supply schemes remains to be established. However, the NORAD Programme Co-ordinator has made some attempt to make preliminary estimates.

To date, some NOK 12.5 million (in 1986 prices) has been spent under the Programme on the operation and maintenance of township water supplies. This represents about 5% of the total Programme costs. It is estimated that the actual costs of operating and maintaining the 8 township supplies will be about NOK 3 million per annum, in terms of electricity, salaries, chemicals, fuels, spares, transport, labour and expert costs.



It is the intention of GRZ to cover such costs as far as possible from revenues collected, and various schemes and proposals have been put forward to achieve this objective. However, with the dramatic devaluations of the kwacha since 1985, the possibility to recover actual costs is correspondingly reduced. Estimates by DWA show that in Western Province the potential annual revenues from water tariffs in 1986 amounted to no more than NOK 250,000, whilst the actual revenues with prevailing tariff levels would amount to no more than NOK 150,000, or about 5% of the amount required to pay for operations and maintenance.

The figures indicate that in none of the townships do revenues collected represent more than 20% of the estimated cost of operating and maintaining the scheme.

This presents the donor with an immediate dilemma, since the Programme is nearing the end of its development phase and most investments have already been done. If the financial responsibility for the period after the development phase is completed, is left entirely with the Government of Zambia, the most likely result would be the gradual collapse of an investment in social development of over NOK 300 million in the course of a few years.

Attempts by DWA to improve revenue collection could improve the situation. There is some optimism that revenues can be brought in line with costs within the next decade if the water tariffs were increased 5-fold, but there is still considerable discussion on whether the consumers would be able and willing to pay such charges.

The most realistic alternative, therefore, is that the Government of Norway is prepared to meet the possible gap between costs and revenues for a longer period in the future once the development phase is completed.

## 4.5 LOCAL VERSUS FOREIGN CURRENCY EXPENDITURES

The comprehensive Programme Accounts data prepared by the NORAD Programme Co-ordinator in October 1986 do not distinguish between foreign and local expenditures on the Programme. This can be done only by undertaking a detailed analysis of the Programme accounts in NORAD's overall accounting system. However, it is possible to make some broad estimates for the purpose of this Evaluation on the basis of the Programme accounts received. This has been done by undertaking an internal examination of the eight major Programme cost components and estimating a foreign exchange component proportion for each. The results are shown as follows (NOK million):

	Expenditure to 31.12.86	Percent Foreign	Foreign Exchange	Local Currency
Consultants	41.8	75	31.4	10.4
Experts	24.6	100	24.6	-
Township Construction	85.9	50	43.0	43.0
Other Investments	49.0	90	44.1	4.9
PWE Labour	18.6	0	-	18.6
PWE Transport	23.3	90	21.0	2.3
O & M Miscellaneous	12.6	80	10.0	2.5
Totals:	255.8	68	174.1	81.6

This gives an estimated foreign exchange component for the entire Programme of about 70%

It would seem reasonable to assume that about half of the foreign exchange employed i.e. NOK 90 million has been spent in Norway, that about 30% has been spent in Europe or Japan on vehicles and equipment i.e. NOK 50



million and perhaps 20% i.e. NOK 40 million on equipment e.g. pipes and drilling equipment etc in the Southern Africa region. About NOK 71 million has been spent in local currency largely on local materials, local salaries and labour.

Township construction was done mainly by the use of local contractors. It is assumed that 50 per cent of the costs were incurred in foreign exchange. If consultancy fees are added, the percentage will be about 70. It could be argued that substantial foreign exchange savings could have been achieved if local consultants had been used more extensively.

Greater efforts might have been made to find and engage local engineering Consultants who could undertake at least some of the simpler design work and retain some of the skills and experience within the country.

Alternatively the Programme might have made a more conscious attempt to build up design capability within the Department of Water Affairs itself which would have made the Department more self-sufficient by now. None of the foregoing is to be regarded as a criticism of the Norwegian consultants who have performed creditably and professionally throughout their engagement on the Programme.

On the other hand, it is also considered that the Norwegian consulting firm concerned could perhaps have been more profitably engaged on more complex consulting work e.g. preparation of water master plans and better quality hydrogeological investigations, in an early phase of the Programme.

The Evaluation Team is left with the impression that the use of foreign consultants to carry out relatively straightforward design operations in Western Province was a rather generous use of funds and foreign exchange.

## 4.6 COST CONTROL

The lack of a proper project identification and appraisal procedure is very evident in the earlier phases of the Programme. Because of the absence of a Project Document with clearly defined and precise objectives, targets, cost targets etc, those responsible for executing the Programme have had no definite guidance on cost ceilings. It appears that as long as some progress was apparent towards the construction of 8 urban schemes and the installation of 800 boreholes/wells, there was limited concern with how much each component cost, as long as the overall Programme Phase allocation was not exceeded.

There has been a lack of detailed financial information available to the Government of Zambia during the early years of the Programme. Costs incurred under the NORAD grant have been registered, processed and analysed in Oslo rather than in Zambia.

On the other hand, the Zambian Government could have shown greater interest in being informed. This has resulted in Zambian staff being unable to participate in the forward planning of the Programme. This situation is now in the process of being rectified with the regular reports on the Programme expenditures presented by the NORAD Programme Co-ordinator in his periodic progress reports.

Absence of effective cost control by Zambian authorities has resulted in limited control over the use of foreign exchange. In the present chronic shortage of foreign exchange, there are strong pressures on donors to channel as much aid to Zambia as possible into the weekly currency auction system. In these circumstances the use of foreign exchange on the Programme should be carefully controlled and reduced.

## 4.7 CONCLUSIONS

### Township Supplies

1. In the townships, the estimated average construction cost per beneficiary when design capacity is reached is about NOK 1,500, which is not unduly high considering the capacity of the supplies.



2. An estimated 70 per cent of the total costs are incurred in foreign exchange. Savings might have been possible if local consultants had been found for the relatively simple design work for the township supplies. The Norwegian consultant may have been more profitably engaged in preparing a comprehensive implementation plan at an early stage, based upon feasibility studies, hydrogeological investigations etc.

### **Rural water supplies**

3. The estimated unit cost for successful wells/boreholes which were in operation in 1986 was in the order of NOK 2,000 per person served. Even if all the 500 or so wells and boreholes sunk under the Programme had been operational the per capita cost would be about NOK 1,200 which is above average cost levels.
4. The costs of providing drinking water from a borehole sunk by the new rotary rigs is estimated at NOK 430 per capita. If implemented as anticipated, this will clearly change the nature of the rural water supply component from a very high cost element to a much more reasonable part of the overall Water Supply Programme.
5. The total transport costs amount to NOK 29 million. This seems high and may be due at least in part to the centralised approach adopted where construction and maintenance of installations is carried out from the provincial headquarters only.

### **Operation and Maintenance Costs**

6. Both with the rural supplies and the township supplies it is too early to establish what the annual operation and maintenance commitment will be. However, it has been estimated that for the township water supplies, the annual cost of operation and maintenance is going to be in the order of NOK 3 million or more.
7. Not much thought was given initially to the issue of the transition from the development to the operational phase. High standards of performance have been accepted, but little thought seems to have been given in the design as to how the Programme can be maintained under different operating conditions.
8. Traditionally such costs are not met by the donor but by the recipient Government through taxes and tariffs. However, in Western Province, evidence shows that Government is able to collect less than 20% of the required funds to contribute to annual operations and maintenance for the township schemes.
9. Too little attention has been given during the Programme to reducing the proportion of foreign exchange expenditures
10. In the past insufficient financial information on the progress of the Programme has been made available to the Zambian authorities. This situation is now improving.

## **4.8 RECOMMENDATIONS**

1. In order to maximize the benefits from the investments already done in the township supplies, Norwegian authorities should be prepared to cover the possible gap between costs and revenues for a longer period in the future once the development phase is complete.
2. Greater consideration should be given to the possibilities for reducing the Programme's consumption of foreign exchange. MDC/NORAD should give consideration in the future to channel larger proportions of funds as counter-value funds directly through the Zambian Government system.
3. More consultation should take place between MDC/NORAD, the Zambian DWA and PWE on the financial progress of the Programme. MDC/NORAD should give more frequent financial data on Programme expenditure to DWA and PWE than has been done in the past.



# CHAPTER 5

## EFFECTIVENESS OF THE WATER PROGRAMME

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### 5.1 THE GEOGRAPHICAL SETTING

Western Province covers the South-Western corner of Zambia and borders Angola to the West and the Caprivi strip of Namibia in the South.

The Province has six administrative districts, namely Kalabo, Kaoma, Lukulu, Mongu, Senanga and Sesheke. Mongu is the provincial headquarters.

The Province consists of a vast, sandy upland plain with an altitude between 800 and 1200 meters. This upland plain is intersected from North to South by the flood plains of the Zambezi river and its tributaries.

Most of the Province is covered by a deep mantle of Kalahari sands. The Zambezi flood plain is traditionally the most important agricultural zone. The annual flooding of the flood plain between January and May, controls the pattern of life for large numbers of people and their cattle, since the largest population concentrations are along the edges of the Zambezi flood plain.

The road network in the Province is mostly under-developed, and feeder roads are very sandy, bumpy and badly maintained. Most of these roads are only suitable for four-wheel driven vehicles. This makes transport of material and produce very difficult and expensive. Communication between the Western and Eastern part of the Province is often best by pontoon or boat.

The two major population groups in Western Province are the Lozi and the Mbunda. The majority of the Lozi speaking people live on the flood plain, while the Mbunda live in the forest areas of the Province. Only limited areas within the Province have suitable conditions for rapid increase in agricultural production without high investments. The sandy upland soil is mainly utilised for cultivation of cassava. Production of millet and sorghum is sustained by manuring with cow-dung. Therefore cattle play a vital supportive role in the crop production sector. In more fertile soils a large variety of crops is produced.

Because of the physical features of the terrain, human settlement is extremely dispersed. The average population density is 3.9 person per square km. ranging from 2.0 for Sesheke district to 11.5 for Mongu district. The low density and spread of population makes adequate provision of public services in the rural areas, such as schools, health centres, and water supplies difficult and extremely costly.



There is an out-migration of men from the rural areas in the age bracket 15-44 years who are searching for employment in urban areas or elsewhere. As a result there are many female headed households in the Province. Lack of men will cause serious problems during the peak agricultural seasons, and will adversely affect agricultural development.

The economy of the Province is characterised by subsistence agriculture supplemented, where possible, by fishing. The modern sector, apart from formal employment in the public service, is virtually non-existent. The combination of the poor soils and low rainfall in the major parts of the Province provides few opportunities for agricultural development beyond the subsistence level.

## 5.2 INDICATORS OF EFFECTIVENESS

The problems in identifying any health- or socio-economic effect attributable to provision of improved water supplies for domestic consumption are many. This is because of the number of variables which may affect the Programme and the inevitable indirect and unrelated effects which may result from any intervention.

Diseases associated with water have been categorised as water borne (e.g. cholera), water washed (e.g. trachoma), water based (e.g. schistosomiasis) and water related (e.g. malaria). Apart from the prevention of epidemics which may result from polluted water supplies, the main positive health impacts of a domestic water supply programme have been identified in the "water washed" group of diseases, i.e. mainly trachoma and diarrhoea, where quantity rather than quality of water appears to be more important. Changes in these diseases are usually in severity, including diarrhoea mortality, rather than in the number of episodes, and are not suitable as indicators of water-initiated improvement in health.

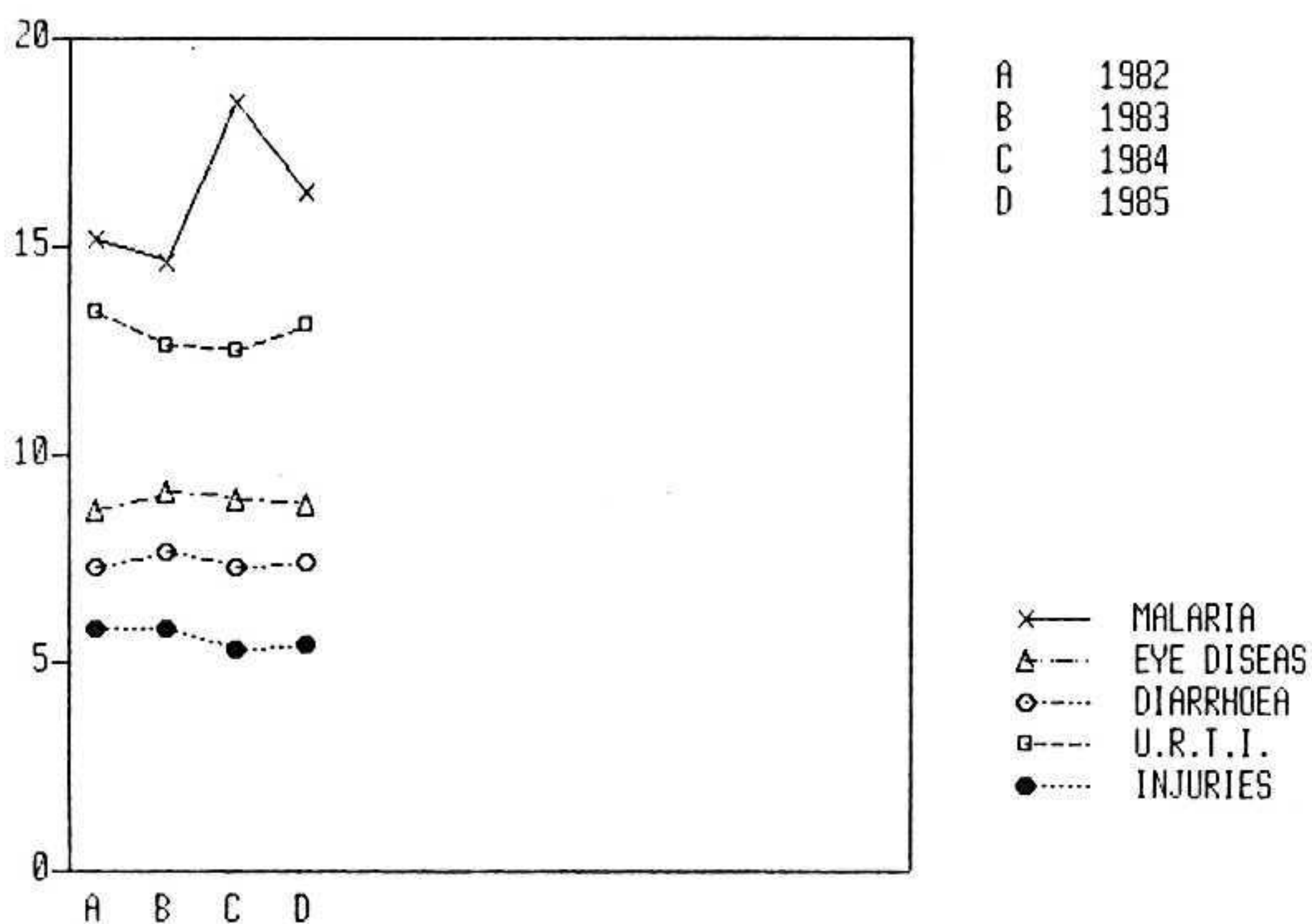
Other indirect indicators of benefits due to domestic water supplies have been identified. Changes in time lost from productive work may be relevant where people are formally employed but is difficult to assess in a subsistence economy. A more useful indicator is the time saved by women in collecting water from improved water supplies, and the increase in the quantity of water used.

Many studies have shown that water consumption is almost the same (about 15 litres per person per day) from communal water supplies up to 1 km. distance. At distances greater than this the amount of water collected falls off rapidly. It only increases when the supply is in the individual home. Thus the effects of the provision of domestic water supplies are easier to identify when traditional sources are remote. This is seldom the case in most of the Western Province.

## 5.3 EFFECTS ON HEALTH

The population in Western Province is around 500,000 with about 83% living in rural areas.

Pneumonia, diarrhoea and malnutrition are the major causes of death in children, and malaria, respiratory tract infection, eye disease and diarrhoea are the major causes of morbidity.



WESTERN PROVINCE OUTPATIENT STATISTICS 1982 - 85  
Percentage first attendance - 5 Main diseases

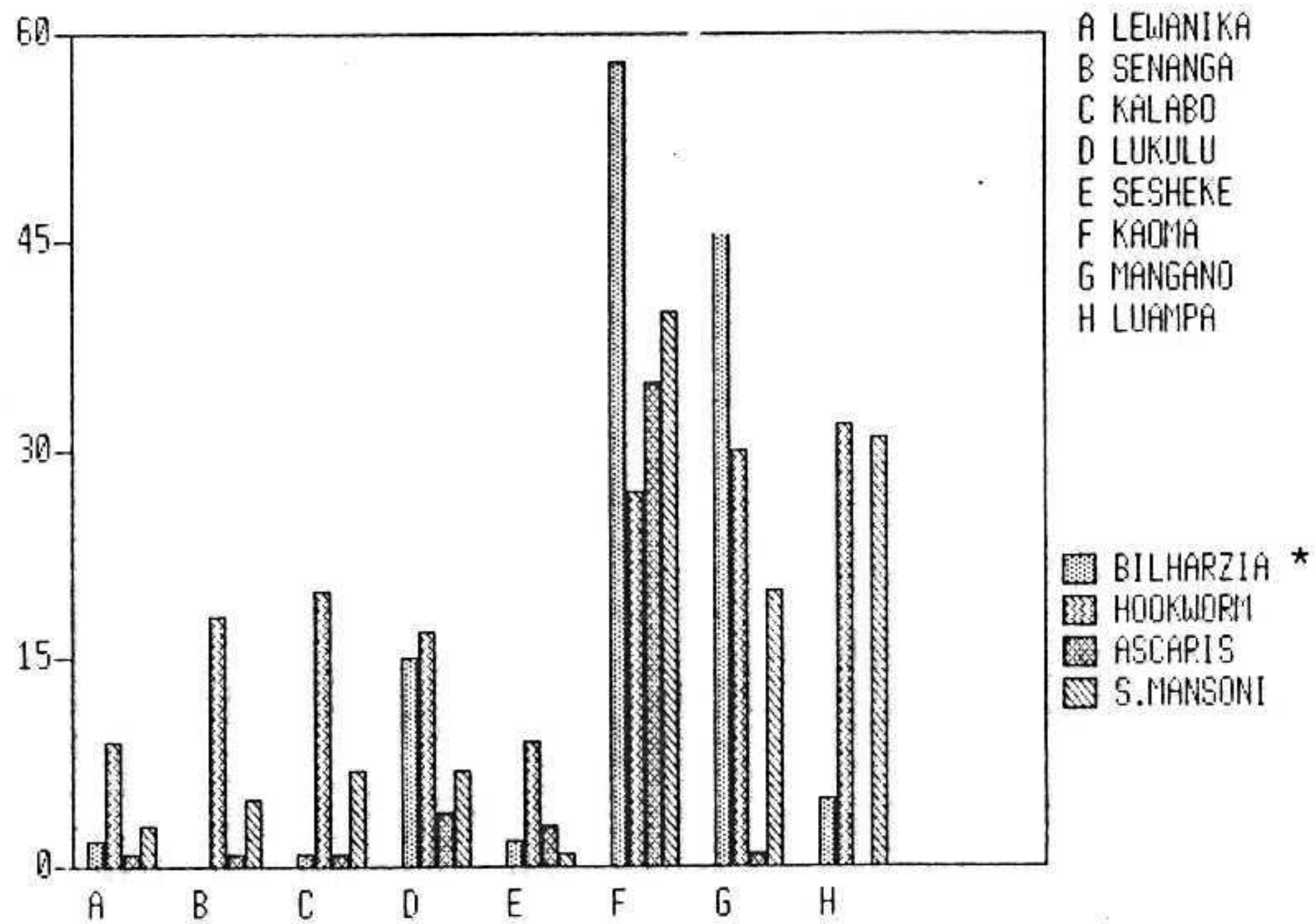
	1982	1983	1984	1985
Malaria	15.3	14.7	18.5	16.4
Eye diseases	8.8	9.2	9.0	8.9
Diarrhoea	7.4	7.8	7.4	7.5
U.R.T.I. *	13.5	12.7	12.6	13.2
Injuries	5.9	5.9	5.4	5.5
Sample **	1,131	1,259	1,249	1,178

\* U.R.T.I. - Upper Respiratory Tract Infections

\*\* Total new outpatients in thousands

Laboratory returns show that malaria and hookworm are common throughout the whole of the Province with especially high rates of malaria, schistosoma haematobium and mansoni and intestinal parasites in Kaoma District. One cannot expect, however, that the incidence of these diseases will be reduced as a result of improved domestic water.





HOSPITAL LABORATORY RETURNS. WESTERN PROVINCE, 1985  
 Percentage of examined cases reported positive  
 (Sample size ranging between 400 - 7000)

Hospital	Malaria	Bilharzia*	Hookworm	Stercoralis	Ascaris	S.Mansoni
Lewanika	29	2	9	5	1	3
Senanga	38	0	18	7	1	5
Kalabo	27	1	20	2	1	7
Lukulu	32	15	17	3	4	7
Sesheke	24	2	9	1	3	1
Kaoma	47	58	27	0	35	40
Mangango	2	46	30	4	1	20
Luampa	30	5	32	5	0	31
Average	25	12	17	3	5	10

\* Schistosoma Haematobium

The justifications for the water development Programme in the Western Province were listed under 4 headings in the feasibility study in 1977:

1. That water investment could be linked to complementary programmes.
2. Existing water supplies were contaminated with schistosoma and E. Coli, so that health benefits would result
3. There would be a saving in time for people collecting water, principally women and children.
4. It would supply a focus for development, and complement medical, educational, industrial, trade and administrative abilities.

No analysis of existing water supplies from the early years of the project could be found. In 1986 the quality of some traditional supplies and improved supplies have been examined, and the table below, refers. The figures refer to dry season conditions. The mineral content of water from boreholes creates some problems (e.g. iron). Bacteriologically, even the traditional supplies were found to be of reasonable standard. Faecal coliforms were isolated in a proportion of traditional sources but the number of organisms per 100 ml was usually under 10 and thus presented little risk to the consumers.

	No. of samples	All coliforms	Faecal coliforms (%)
Open surface water, canal, stream	8	8	5 (63)
Traditional source-Scoop hole	33	31	6 (18)
Protected shallow Well	23	12	2 (9)
Borehole	25	2	0 (0)

Although cholera was spreading throughout the African continent in the 1970's and was present in the Northern Province of Zambia and in surrounding countries, it did not affect the Western Province. However, the absence of any water borne epidemic cannot be attributed to the water Programme.

Parasitic infections appear to be most common in Kaoma District which is an area well away from the flood plain and with less accessibility to natural supplies (Table 2.). This district has not been provided with improved domestic water supplies so far, apart from 3 dams built in the early years of the project. DWA without NORAD has supplied about 150 shallow wells and over 50 boreholes. Potentially therefore, Kaoma district with its relatively small rural population, may be better served with improved water than the districts in which the programme has been active. Without data from the early years it is not possible to say whether the dams may have contributed to a high prevalence of schistosoma haematobium and mansoni in the District, or whether these parasites were endemic to the area before that.

Hookworm infestation is commoner in sandy areas and is unlikely to be affected by domestic water supplies but rather by methods of excreta disposal; whereas ascaris infestation is associated with hygiene practices such as lack of hand-washing or vegetable washing. Kaoma District has a significantly higher proportion of stools positive in ascaris although the difference in hookworm infestation is not so great. Again these differences may represent a long-standing need in Kaoma District rather than an improvement in the situation in other Districts.

There has been no difference in the proportion of first attendances at health services between 1982 and 1985 due to the 5 main causes of morbidity, viz. malaria, eye disease, diarrhoea, upper respiratory tract infection or injuries (Table 3). There were 135 child deaths in hospitals from diarrhoea in 1984 and 123 in 1985. This data is incomplete, however, as the denominator for 1984 is lacking.



Malnutrition affects around a third of young children who were examined in a recent survey as evidenced by static height or loss of weight. Water supplies alone may affect children's nutrition only when there is insufficient water to prepare at least three meals a day. Studies would be needed to assess the effect of a combined health education and water provision programme on diarrhoea and childhood malnutrition.

## **5.4 RURAL WATER SUPPLIES**

A study of 4 villages comprising 170 households with 917 individuals was undertaken by the CEP-team in the dry season in June 1986. Three villages had been provided with a water supply with hand pumps, while the remaining village was waiting for installation. The size of the villages ranged between 27 - 58 households. They are thought to be fairly representative of the way of living in the area, but the differences existing between them in tribal composition, socio-economic level and access to water were substantial. This was thought to have a bearing on the people's appreciation and use of water.

### **Utilization of Water Supply**

It was found that 40 per cent of the households were using the improved water supplies exclusively. In two of the villages observations revealed extensive use also of traditional sources. Of the 60 per cent using both traditional and improved sources, 26 per cent used the traditional source as their main supply. In one village only both interviewing and observations suggested that the improved supply with handpump was the only source of water in use. This was mostly because of its convenient location, reducing the water collection journey from an average 800 meters to 140 meters for most of the families. In the two other cases, the average distance to the improved and the traditional well was much the same.

### **Quantity of water used**

It appears that the volume of water used is low. It is generally assumed that a positive effect of an improved water supply can be expected only when water use is at least 20 - 30 liters per capita per day. In the most successful village, where water was drawn exclusively from the hand pump, the per capita volume was only 9,9 liters. This was 40 per cent more than the volume drawn in the control village with no improved water supply, and was achieved because people tended to make three rather than two water collection trips per day after the new water supply had been introduced.

However, people using traditional supplies may wash clothes and bathe at the water site especially if this is a river. Thus there is no evidence that people in the village using the improved supply only actually use more water.

### **Hygiene Practices**

Only 56% of the households surveyed cleaned the vessel used for transporting water. The proportion was higher in the control village using the traditional supply than in the village using the improved supply exclusively.

The use of water for personal hygiene drawn from the improved water supply seems to be minimal. Most people were found to favour the stream for washing clothes and utensils, and for bathing, and these practices will probably only change if the new water supply is very close to the home, or with the impact of health education. Hand washing following defaecation was apparently rare.



## Time Saving

A general conclusion drawn from the study was that the improved water supplies are underutilized. In cases where people have easy access to alternative sources, this would not be unexpected. An estimated 70 per cent of the population in Western Province live near or on the flood plains with relatively easy access to water most of the year. Although these communities often express need for an improved water supply, few people are prepared to walk further for improved water.

The amount of time saved for water collection is a direct function of the distance between the house and the water supply. Only in one of the villages surveyed, was the median distance to the water supply significantly reduced by the introduction of the improved water supply. On average the distance was reduced by 2.5 km per household per day, which would correspond with a time saving of 0.5 - 1 hour per day, which is a considerable achievement.

However, for most people in Western Province, the distance to traditional water sources is relatively short most of the year, so that the element of time saving will not be a main justification for the Programme. The survey nonetheless tends to indicate that increased convenience, i.e. reduction of time spent on water collection, is the aspect most appreciated by the villagers.

## Washing Slabs

A number of washing slabs have been constructed near the pump after collection of K 60.00 from the villagers. These can only be used by one person at a time and waste water drains onto the ground directly below. In some villages there is a rota for use of the slabs and this may create a focus for dissension rather than community integration. The washing slab was evolved in consultation with villagers and after consideration of cost. However, improved designs such as partitioned ground level slabs should be sought, taking into account the need for social interaction.

## Functioning of the Water Supplies

For the Programme as a whole it was reported that only a third of the 256 boreholes constructed up till July 1986 were equipped with handpumps. However, as many as 85 per cent of these handpumps were operational. Also, 80 per cent of the 231 hand dug wells that had been constructed were in use. Although the survey indicated that the water supplies with handpumps were functioning well, some complaints were voiced about Blair-pumps by pregnant women and elderly women, who did not like to work the pump in a bent-down position. Small children from five years onwards, however, were able to operate the pump.

The hand dug wells were more problematic, and the windlass at the well in one of the villages was found too difficult to operate for elderly women as well as young children. Also there is a problem of contamination of the supplies through the open hole at the top of the well.

Queueing was not found to be a problem in the villages visited by the Evaluation Team. The survey indicated that it took between 1 and 2 minutes to fill a 15 liter bucket from the improved water supplies, which would compare with an average 1.5 minutes from traditional sources. It was observed by the Evaluation Team however, that in some villages the pumps had a very slow flow-rate and considerable physical effort was needed to fill a bucket.

It was found that in general, the hygienic conditions around the water supplies constructed in the early phases of the Programme were sub-standard. More recently constructed supply points, however, were equipped with proper headworks and soak-aways.



## **Economic Effects**

No direct positive economic effect was evident such as vegetable gardens near the water supply. Most pumps have a banana and sometimes a tomato plant growing at the end of the soak-away and the village committee in one village said that any produce would be sold. The income from this would be minimal, but could probably be increased by extending the garden or possibly encouraging a small plot for the caretakers when they are appointed.

Other possibilities for local production needing water should be identified. Dams were initially constructed to assist in watering cattle and could be reconsidered for animals as well as for fish farming and small scale gravity irrigation. They should be properly maintained to decrease the likelihood of becoming sources of infection for schistosomiasis.

In general, the limited amount of information available to the Evaluation Team does not allow for a comprehensive assessment of the effectiveness and the benefits of the Programme. The survey referred to above which was limited to 4 villages in one geographical area, can only give a few pointers. The most valid lesson that can be drawn from the survey is probably that the villages in the Western Province are generally small, with few households in each, and the socio-cultural, geographical, hydrological and economic conditions are far from uniform. This makes it difficult to generalize about the benefits of the Programme.

In the previous phases of the Programme, hardly any efforts were made to study the social reality in Western Province in order to identify the needs and assess the impact of the Programme. Because of this, it has been impossible for the Evaluation Team to assess to what extent the rural water supply component in the Programme is justified in terms of benefits for the recipients, – or could be justified in the future.

Under Phase IV of the Programme this situation has greatly improved, after the appointment of a Health Coordinator and establishment of a CEP-team. A set of criteria for allocation of water supplies, based on assessment of water needs, development potentials, technical feasibility and social feasibility has been introduced. This is examined more closely in chapter 8. Also a system for continuous monitoring and evaluation of performance and achievements has been developed.

With these instruments at hand, it will be an important task in the time to come for the project team themselves to establish to what extent the Programme is justified, and if so, – to guide the activities into high-priority areas where benefits can be maximized.

## **5.5 INVOLVEMENT OF WOMEN**

An important objective of the Western Province Water Supply Programme has been to improve the situation of women and children in the Province.

No statistical data exists for Western Province, but as in all traditional Zambian societies, women and children have the practical responsibility for collecting water. It is likely that as many as 90 per cent of those collecting water from traditional sources are women and children. Improved access to water will therefore immediately reduce the physical burden on women and children. Because of this, women can also assist in promoting improved health and hygiene routines by the use of improved water supplies. It has therefore been understood for some time that the active participation of women in the planning, design and implementation of urban and rural water supplies is a key to the successful establishment of the Programme.

At the beginning of the Programme there was no conscious policy of involving women's participation directly in the Programme. There therefore seems to have been a general feeling of alienation towards the Programme, especially in the rural water supply component. People in general and women in particular were not consulted in the implementation of the Programme. There was no formal mechanism in the early stages to consult women on their opinions.



This is exemplified by the frequent siting of improved water supplies adjacent to traditional supplies without having consulted the local population. The design of some schemes also indicates a lack of consultation with women as the main users, and there have been complaints from older women about the difficulties involved in operating pumps and windlasses on improved supplies.

The University of Zambia in a 1984 survey found that only 3 out of 191 women in project areas had been consulted by the headman or NORAD about the siting of the well. Similarly some 50 per cent of women interviewed would have preferred the well to be sited elsewhere. There is also evidence to show that, given the choice, some women would have preferred assistance with generating economic activities and cash rather than improved water supplies.

A considerable change in policy has taken place with regard to women's participation after the establishment of the P-WASHE Committee, the Project Review of 1984 and the establishment of the Community Education and Participation (CEP) Programme in 1985. Conscious attempts have been made to involve women at all levels of the Programme, both as consumers and as executors. On the consumption side women have been engaged in the Village Water Committees and out of 29 recently selected Committees 89 out of 186 Committee members were women. It has, however, been observed that women on the Committees still often maintain a traditionally passive role so that their participation is not as active as it might be. Despite efforts to recruit more the ratio of women on the P-WASHE and D-WASHE Committees is still low.

On the executing side, the Programme has been successful in recruiting some women for the pump installation teams. These show in very visible terms to local communities that women have a direct and very important role to play in project implementation. In the CEP Team, the Co-ordinator is a woman as are several of the field staff, and this has made acceptance of the Programme much easier. It should, however, be noted that it has proved very difficult to recruit women to traditional men's technical positions on the Programme e.g. technicians.

## 5.6 TOWNSHIP WATER SUPPLIES

The township component of the Programme includes the upgrading of the water works of 8 township supplies in Western Province, to a production capacity determined by Zambian Authorities. Distribution of water is done through the old reticulation systems in the towns.

At the request of the Evaluation Team, a minor survey of functioning/utilization of water supplies was done by the CEP team. The study covered 146 households in Mongu and Namushakende townships. Recording of water collection was carried out for 2 domestic points in both townships by uninterrupted observation for 48 hours.

Since the study was done only in one geographical area and does not cover a representative sample of the population, the findings can only be taken as indicative and should not be interpreted as valid for the whole of Western Province.

The study was undertaken in low cost residential and squatter areas where water was drawn from communal taps.

### Functioning of water supplies

The functioning of the water supplies was found to be good. This corresponds with the overall picture for the 8 townships where between 75 - 100 per cent of the supply points were reported to deliver water at a reasonable service level. The exception was Mongu, where only 60 - 70 per cent of the supplies were in operation. Also the leakage detection study from 3 townships in 1986 (Limulunga, Kalabo and Lukulu) found that 90 per cent of the communal taps were operational. The average time to fill a 15 liter bucket was between 0,5 and 1 minute. All supply points, however, were reported to have a reduced output during the dry season.



In the area surveyed, there was no local caretaker responsible for operation and maintenance of the supply points and in 7 of the 11 cases, it was reported that no technical inspection had been made of the facilities during the last year.

### **Utilisation of water**

The distance between the water supply and the consumer's houses was found to be between 5 and 300 meters. For the majority of households, however, the average distance was between 30 and 50 meters. Because of this, each household made between 4 and 9 trips to collect water each day, as compared with 2 - 3 trips in the rural areas. Despite this, the quantity of water drawn was on average only 40 per cent higher than in the rural area, ranging between 10 and 23 liters per person per day. It should however be noted that a considerable amount of clothes washing was carried out near the taps. Large amounts of water were also used for personal hygiene, since 7 of the supply points were equipped with communal showers.

The number of households using the taps was between 4 - 25 per tap, – in one exceptional case 61 households or more than 230 people.

The survey quoted above, as well as other reports indicate that the Programme has succeeded in providing water to the township population in Western Province at a reasonable service level, both in terms of quality and quantity of water.

### **Hygiene and sanitation**

Areas where improvement is possible (although it is outside the scope of the Programme at present) is the upgrading of domestic supply points to a hygienic standard, with aprons, runoffs and soak-aways. The township survey indicated that 5 out of 11 supply points were sub-standard with dirty or muddy surroundings.

It was found that, in general, sanitation is poor in these densely populated areas. Both the number and the standards of latrines are low, and a lot of households used the bush for defecation. 55 per cent of the population used latrines, while the problem of indiscriminate disposal of childrens stools were reported in 91 per cent of the families with children. Because of this, and the rather low level of knowledge of disease prevention in the area, it would appear that a combined Programme of health education and latrine construction in the future might give important results in terms of health improvements.

### **Distribution of water**

The total population of the 8 townships in Western Province served by the Norwegian assisted Water Supply Programme is about 60,000 people according to the 1980 census. Today's population is about 85,000, assuming an annual growth rate of 6 per cent. The population is divided into consumer groups according to housing standard and service level, assuming different per capita consumption in the different consumer groups.:

High-cost housing	- 250 l/cap. day
Medium-cost housing	- 250 l/cap. day
Low-cost housing	- 100 l/cap. day
Informal housing	- 40 l/cap. day

In 1981, a water pricing study was done by the Norwegian Institute for Water Research (NIVA) to examine the present pricing policy in the Province and recommend an appropriate tariff structure.



According to the figures presented in this study, 84 per cent of the population, living in the low-cost and squatter areas, were served by communal taps. The remaining 16 per cent, living in the high, medium and low cost residential areas had individual house connections. With the design consumption figure quoted below, the consumers with individual connections were assumed to consume 72 per cent of the water, and the communal tap users 28 per cent.

No data is available to assess the actual distribution of water between the consumer groups. The figures available through the leakage detection study which was started 1986, indicate that in addition to the water consumption anticipated, extensive watering of gardens in some areas may more than double the consumption for some of the consumers in the high cost housing group.

The actual distribution of water consumption should be reflected in the water tariffs applied. Since the metering of water consumption in houses with individual connections usually does not work, most consumers are charged a flat rate each month. The water tariff study in 1981 indicated that these rates favoured the high/medium cost consumer group. Moreover, it was found that revenues collected were failing dismally to cover the recurrent costs of operating the schemes. It was suggested that more differentiated water tariffs were introduced, which would better reflect actual costs as well as the distribution of water between the consumer groups. The following price structure was recommended for non-metered supplies:

- Communal tap users employed by Government/District Council, occupying Council houses should be charged K 1 per month. All other communal tap users should not be charged
- Low cost households, K 5 per month
- Medium cost housing, K 10 per month
- High cost housing, K 15 per month

In 1986, the prices were adjusted to the level suggested above. No differentiation was made, however, between medium-cost/high-cost housing, and the flat rate of K 15 was applied. Low-cost households are charged K 6 per month, and communal tap users are charged K 2 per month, not differentiating between government employees and others.

DWA has suggested in a study September 1986 that this tariff structure should be retained for the coming 5 years but that the tariff should be adjusted upwards annually.

The present system used for collection of water tariffs has a low rate of cost recovery and unjust distribution of payment. Figures from 4 townships (Lukulu, Namushakene, Kalabo, Senanga) which were presented to the Evaluation Team, indicate both a general lack of payment of water tariffs, and a higher payment rate from the low-cost housing and informal housing group than from the high-/medium-cost housing group.

Three problems thus remain to be solved in the future:

1. Prices should reflect distribution of consumption. This will require a study into the actual consumption pattern of different consumer groups
2. Prices should reflect costs, and this will need further investigations into the question of people's ability to pay for water in the different consumer groups
3. Collection of water charges must be improved. This will require a strengthening of the administrative routines of DWA, and the DCs.



## 5.7 CONCLUSIONS

1. General health statistics from the Western Province do not show any change in morbidity from the most common diseases which could be influenced by improved water and sanitation.
2. Although there have been no water-borne epidemics in the Province in the last 9 years, there is no evidence that new domestic water supply schemes have improved the overall situation.

### Rural Water Supplies

3. Based upon the limited information available to the Evaluation Team, the benefits from the Programme in terms of health impact, time saving and economic effects are limited. There is little evidence for increased use of water or of improved hygiene habits. Some new schemes may be underutilized.
4. Two thirds of the boreholes and one third of the shallow wells have been located near public institutions where there is a great need for safe water. 31 of 86 health centres in the Province have so far been provided with an improved water supply.
5. The failure to analyze the socio-economic situation in the Western Province during the initial phases of the Programme, adversely affected selection of priority villages with the greatest need for improved water.
6. During the last two years this has improved after a CEP-team was attached to the Programme. Attempts are now being made to link the water supply component to complementary development activities.
7. Because of the present lack of relevant information, there is a need for the project staff, through monitoring and evaluation of activities, to present evidence in order to establish to what extent the rural water supply project is justified or not.

### Township Supplies

8. The Programme has succeeded in providing a large proportion of the poorest population in the 8 townships in Western Province with a reliable source of improved water at a reasonable service level.
9. The water supply project is justified in terms of its benefits in the densely populated low-cost residential and squatter areas where most people live.
10. There is a significant increase in consumption of water compared with the situation in rural areas.
11. However, at present the payment of water charges from different consumer groups does not reflect the actual consumption of water in the different consumer groups, resulting in an underpayment for water by the consumers in the high/medium cost residential areas.
12. There is a strong need for an upgraded hygienic standard of communal supply points, improved sanitary facilities and health education programmes in the townships, and it is assumed that substantial health improvements thus could be achieved with relatively limited means.



## **5.8 RECOMMENDATIONS:**

1. As Kaoma District has a high prevalence of parasitic infestation, priority should be given to improving water supplies in this District.
2. The monitoring and ongoing evaluation of programme achievements should be continued particularly in the rural areas in order to assess to what extent the Programme is justified, and to guide activities into priority areas where benefits can be maximized.
3. A pilot sanitation and health education programme should be initiated in Mongu township. The effectiveness of the Programme should then be evaluated in order to assess whether it is justified to extend the Programme to other townships.







## CHAPTER 6

### EFFICIENCY

#### 6.1 BUDGETTED AND REAL COSTS

In virtually any development sector, an important measure of efficiency is found by comparing project costs with project budgets. If it costs more than intended to achieve a certain result, this may be taken either to be an inefficient use of scarce resources in relation to other possible expenditures and investments in other sectors, or it may reflect that the budgeting was unrealistic, or both.

There are some difficulties in comparing the budgetted Programme costs with the real costs of the Programme. As indicated elsewhere in this Report, limited systematic forward budgetting has been carried out during the execution of the Programme. This is partly due to the lack of overall master plans which could have provided the necessary planning and budgetting data. However, it is possible to compile a picture of the Programme budgets by consolidating the various Agreements, Programme Reviews and reports.

The original Programme Budget, set out in the Phase I Agreement, amounted to NOK 17.2 million to the year 1980. Some NOK 3 million was allocated in addition for consulting services and experts outside the Phase I Agreement. If we assume an annual inflation rate of 8 per cent, this would correspond to some NOK 32 million in 1986 prices. To-day the total Programme budget to the year 1989 has become NOK 260 million (in current prices) or NOK 315 million in 1986 prices. The Programme elements today are very similar to those originally promulgated in 1976. It therefore appears that the original budget has expanded by about 10 times from NOK 32 million to NOK 315 million. It has to be made clear however that the physical scope of the Programme has also expanded since 1977.

Year	Cumulative Budget (NOK million)	Cumulative Expenditure (NOK million)
1977	17.2	-
1978	17.2	n/a
1979	17.2	n/a
1980	27.9	34.3
1981	50.2	58.0
1982	83.8	93.6
1983	106.4	118.5
1984	129.1	143.7
1985	150.8	166.0



According to the terms of the first three Agreements for the Programme, the cumulative budgets and expenditures for the Programme are shown above. It should be noted that certain minor additional items have been covered outside the Agreement, so that the agreed budgets are less than the actual expenditure.

As stated elsewhere in this Report, there has been surprisingly little technical documentation and planning on which Programme budgets have been based. The budgets for each component of the Programme appear in the various Programme Agreements. The following budget components up to 1985 (mill NOK) are listed below.

Unfortunately, because of the very generalised budgeting systems employed, it is almost impossible to compare budgets with one another or with actual expenditure over the period 1977 to 1985. Only two elements i.e. Township Water Supplies and Rural Water Supplies are capable of comparison because of the definition of Programme elements used.

	Phase I 1977-79	Phase II 1980-83	Phase III 1984-85	Total 1977-85
Township supplies	9.8	70.7	17.0	97.5
Rural supplies	1.7	6.6	24.0	32.3
Workshop training	0.5	4.0	2.0	6.5
Other Expenditures	2.4	2.9		5.3
Dams	0.4	0.8		1.2
Consultants	2.4		2.0	4.4
<b>Total</b>	<b>17.2</b>	<b>85.0</b>	<b>45.0</b>	<b>147.2</b>

It appears that some NOK 97.5 million was budgetted for Township Water Supplies in the first three phases of the Programme whilst expenditure was only NOK 86.1 million in the same period or about 12 per cent below the budgets. With Rural Water Supplies, the situation was somewhat different. Some NOK 32.3 million was budgetted for whilst actual expenditure in the same period has amounted to NOK 51 million. This indicates a sizeable underestimate on the likely costs of the Rural Water Supply Programme.

If the Programme budgets for Rural Water Supplies as expressed in the first three Agreements are compared with the development of expenditure, then the following picture emerges (current prices):

Year	Cumulative Budget (NOK million)	Cumulative Expenditure (NOK million)	Difference (NOK million)
1977	1.7	-	-
1978	1.7	-	-
1979	1.7	-	-
1980	1.7	10.0	8.3
1981	8.3	16.1	7.8
1982	8.3	25.6	17.3
1983	8.3	34.2	25.9
1984	32.3	42.0	9.7
1985	32.3	51.0	18.7

This again demonstrates the sizeable gap between expenditure on rural water supply and the funds budgetted for it.



## 6.2 THE PLANNING AND BUDGETTING PROCESS

It is axiomatic that expenditures should correspond to Programme budgets and that Programme budgets should have a realistic base in a plan for the Programme. The planning process for the Western Province Water Supply Programme has been rather diffuse and the Evaluation Team has attempted to chart its progress.

The Phase I Agreement was based on the technical recommendations set out in the Feasibility Study of 1976. This assumed the construction of 7 township water supplies i.e. Lukulu, Kalabo, Kaoma, Mongu, Namushakende, Senanga and Sesheke and the establishment of about 700 well-points so as to establish a rural water supply, construction of a workshop, a training centre and construction of dams. Staff housing and consulting services were added later.

The study does not make it entirely clear but it is reasonable to assume that the authors estimated that about 80 per cent of the proposed work could have been completed by 1980 for some NOK 17 million (in 1977 prices). For both the township supplies and the rural water supplies a least cost approach was recommended suggesting that there was considerable concern with holding down costs in the initial planning stages.

No precise cost targets are put forward, but from internal evidence in the report it appears that about 70,000 persons in the rural areas were to be supplied at a cost of about NOK 1.7 million or NOK 25 per capita. On the township supplies, some NOK 9.8 million was allocated for some 80,000 persons at a per capita cost of NOK 125. It must be emphasised, however, that no precise target populations were defined for the different components of the Programme in the feasibility study.

It appears that it very soon became evident that the Programme was, in fact, of a much greater magnitude. In December 1979, a comprehensive re-assessment of the Programme was presented in a Board Document (134/79) to NORAD's Board. This stated that the full magnitude of the Programme requirements could not be fully appreciated until consultants had undertaken detailed investigations and design work.

Technical investigations carried out by the consultant in 1978 and 1979 and requests from Zambian authorities, revealed that a higher standard of township water supply than originally conceived would have to be adopted and that the planning horizon should be extended to 1993. In addition it was recommended to include the township of Limulunga, north of Mongu in the Programme. A budget of NOK 85 million was approved for Phase II.

The Board Document goes on to set out targets for the Programme by assuming that the 700 planned wells in the rural programme will serve some 70,000 persons and that the township supplies will serve some 100,000 persons. The total cost of the township supplies was now estimated as NOK 70.7 million whilst the 700 wells were estimated to cost some NOK 6.6 million. This brought the per capita cost for the township supplies to something like NOK 1,000. This was considered very similar to the similar Norwegian supported Minor Urban Water Supplies in Kenya. The per capita cost of the rural water supplies was estimated to be around NOK 100.

The NORAD Board Document No. 125/82 of December 1982 sets out the arguments and laid the basis for the Phase III Agreement, which was based to some extent on a Programme Review undertaken by NORAD personnel in January 1982.

This review reveals that, during Phase II of the Programme, expenditure on the township supplies was only 76 per cent of the sum budgetted. However, on the rural water supplies, expenditure was 3 times that budgetted (ZK 7.5 million expended versus ZK 2.5 million budgetted).

Also the question of future operations and maintenance of the township water supplies was taken up. The problem of the gap between revenues and costs was recognised and discussed. In fact the Board Document recognises that, because of Zambia's growing financial difficulties at this time (because of falling copper prices), Norway should be prepared to consider assisting with operations and maintenance costs in at least some of the townships for at least some time to come after the completion of the township programmes.



Some NOK 45 million was allocated to Phase III including some NOK 4 million for operations and maintenance. In the budget, the high cost of the rural water supply component of the Programme appears to be recognised for the first time and some NOK 24 million is allocated for the construction of some 300 wells/boreholes. This would indicate a very approximate per capita cost of about NOK 600 to NOK 800.

The Phase IV Agreement signed in December 1985 has largely been based on the plans and recommendations set out in the report of the NORAD Project Review Mission of February 1984. This included a number of recommendations on NORAD's responsibilities, on the organisation of the Programme, on operations and maintenance, training, consulting services, programme planning and financing. In addition, the Phase IV Agreement takes full account of the establishment in 1984 of the Provincial WASHE (Water, Sanitation and Health Education) Committee.

However, the most important planning basis for the Phase IV Agreement was the Draft Implementation Plan of November 1984, recommended by the Project Review Mission of 1984. This Plan was up-dated and produced in March 1986. The purpose of this plan is to set out the overall objectives of the Programme, its targets and the resources required to meet these targets. This includes the completion of the Township Supply Programme (3 schemes) and the present Rural Water Supply Programme (800 supplies), and to provide operation and maintenance of all constructed water supply facilities.

The estimated cost of this work for the 4 year period 1986 to 1989 is put at NOK 100 million of which NOK 17 million is devoted to township supplies, NOK 13 million to rural water supplies, NOK 8 million to consultants and NOK 16 million to experts. A further NOK 29 million is allocated to general and recurrent expenditures including operations and maintenance.

## 6.3 COST COMPARISONS

The Evaluation Team's Terms of Reference call for an assessment of the real costs of the Programme in relation to similar water projects. It is generally agreed that this is extremely difficult because of the difficulties in finding comparable values and in comparing like with like. In some projects "costs" include the administrative and managerial component. In others they do not. Projects are operating in different geology, use different combinations of equipment and aim for different standards of provision. The question of comparison is therefore very complex.

However, as a guide to performance, most agencies concerned with urban and rural water supply have been concerned to find some simple, easily understood measure of performance which can be expressed in terms of investment cost per unit undertaken or per recipient served. What was rather remarkable about the Western Province Programme is that no simple unit cost target was established early on in the Programme.

### **Township water supplies**

In Chapter 4, it is estimated that the likely cost per beneficiary of the township water supplies thus far is about NOK 1,500 (although there is probably a range of from NOK 500 to NOK 3,000). These costs are all-inclusive, i.e. the costs of personnel, consultants, experts and administration, but exclude depreciation on vehicles and equipment. It is expected that the per capita costs will fall slightly as the population increases towards the design population within those communities where water supply schemes have been completed.

It has been difficult to find comparable figures for small urban areas in Africa. However, in the Minor Urban Water Supply schemes in Kenya supported by MDC/NORAD, it has been estimated that development costs (including administration and expatriate management costs) have ranged from NOK 600 to NOK 2,500 per capita (1986 prices). Recent evaluation work on these schemes indicate that they have been relatively low cost and successful in meeting their targets.



## Rural water supplies

Comparison is even more complex in rural water supply projects because of the variety of factors which come into play. The nature of the geology, the ease of access, the size of communities and the type of equipment employed all have an important bearing on cost development and are different in every individual case.

In Chapter 4 of this Report we have estimated that the unit cost for successful wells/boreholes after 9 years of work is something like NOK 1,500 per capita. When rehabilitation of existing wells have been completed, the unit cost is reduced to NOK 1,200. The estimated unit cost for wells constructed in the period 1986-89 is 430 per capita, which will bring the estimated average unit cost for successful wells/boreholes for the entire programme down to NOK 800 per capita.

For the sake of comparison it should be noted that in villages in Tanzania (Rukwa and Kigoma Regions) where conditions are admittedly different the per capita costs are ranging between NOK 800 and NOK 1,200. Indirect evidence from the MDC/NORAD financed Rural Water Supply Programme in Zimbabwe indicate that the unit cost per capita in Zimbabwe is slightly lower than in Tanzania.

## 6.4 CONCLUSIONS

### Rural water supplies

1. The planning and budgeting function on the Programme has been very weak. It should, however, be added that this is in the process of changing and the Implementation Plan of March 1986 gives considerable grounds for optimism.
2. The Phase I Agreement of 1977, was unrealistic in relation to its very ambitious targets. This was mainly because of inadequate feasibility studies. Radical re-budgetting took place in 1978/1979 on which the Phase II Agreement was based.
3. In the Phase II Agreement, the complexity of a rural water supply component seems to have been underestimated. A main reason for this was a general lack of knowledge of the hydrogeology of the Province, physical and economic planning, and quality control.
4. A radical reorganisation of the budget for Phase III was therefore undertaken. The reasons given for the substantial cost over-run i.e. from NOK 32 million to NOK 51 million actually were a clear under-estimate of the extent of the work involved on the rural water supplies.
5. Instead of adopting a system of forward budgeting, budgets have been drawn up and revised in order to keep pace with Programme expenditures, rather than the other way around. The Programme budgets have been very generous and there has been very little budgetary discipline.
6. It can be argued that there was a need for a very liberal attitude to the budget given the novelty of the Programme and the lack of knowledge of the Programme area. However, it is considered that there would have been less need for liberal budgeting and less total expenditure if the Programme had been better planned from the beginning.

### Township water supplies

7. The Township Supply Programme is probably more expensive in terms of cost per capita than other schemes in Kenya, Tanzania and Zambia, but not appreciably so.



8. In the township supplies, detailed engineering was used to establish a budget which was more or less adhered to.
9. Many of the problems associated with this programme could have been avoided if a formal system of programme identification, preparation, appraisal, negotiation and implementation had been adopted, e.g. of the type used by the World Bank.(This is discussed in chapter 8).



## CHAPTER 7

# RELEVANCE

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### 7.1 RELEVANCE IN RELATION TO NATIONAL TARGETS

This chapter examines briefly the Programme's relevance to national policies and goals within Zambia and how far it is assisting in achieving these.

During Phases I-III the main objective of the Programme was to develop the water resources of Western Province primarily for domestic consumption in both urban and rural areas. The Programme was seen as an integral component of the socio-economic development of the Western Province. The earlier objectives were broadened in Phase IV to include the following specific components:

- integration in the GRZ system
- community participation in planning, construction and maintenance
- health education
- operation and maintenance
- increase local capacity for planning, implementation, operation and maintenance through human resources development

Various activities have been implemented towards the realisation of these objectives: – namely, the integration of the Programme into the PWE office and WASHE Programme, strengthening the CEP component, inclusion of operation and maintenance into the Programme budget, and support for a water quality surveillance programme in rural areas (co-financed with WHO/UNEP).

By 1990, at the end of Phase IV, it is projected that the township water supply system will have the capacity to serve 135,000 people. The urban population is expected to reach only about 110,000 people. For rural areas the targeted water supply coverage is 230,000 people out of a total population of 475,000. The total water supply coverage for the whole Province by 1990 will be 64 per cent, whereas for urban areas it will be 100 per cent, and for rural areas it will be slightly above 48 per cent.



## 7.2 RELEVANCE IN RELATION TO OTHER OBJECTIVES

There was no evidence that the earlier phases of the Programme had any programme implementation plans. However, under Phase IV, greater attention has been paid to implementation planning. The Rural Water Supply Programme staff is currently engaged in the process of producing an implementation plan. This exercise is expected to be completed by end of third quarter of 1987.

One of the objectives under Phase IV is to develop Zambian manpower at all levels for the purpose of increasing self-reliance in the administration, execution and maintenance of water supply facilities. While some training of skilled and semi-skilled personnel has been, and continues to be done at the Training Centre, there are no specific programmes of human resources development especially for professional staff. There is no measure, therefore, of how the objective of human resources development can be met.

A very positive development, under Phase IV is the inclusion of operation and maintenance under the Programme budget. For township water supply systems several activities have been planned for, and some are already being implemented. Even in rural water supplies initial efforts are being made, through pump installation teams and CEP teams, to provide training for operation and maintenance.

The role of women in water supply activities is recognised and, to a large extent, being enhanced through CEP activities. In places where water/well committees have been established, women are beginning to play a significant role. Pump installation teams include women as well.

The Water Supply Programme has reached some of the most remote areas of Western Province. Though the coverage is more intense in the areas of high population on the edge of the flood plain, other densely populated areas in more remote corners of the Province are being approached. Thus the target population has included the poorer sections of the community in the Province. This aspect of the Programme was highly commended by the local leadership at district and ward level and highly appreciated by the local communities.

## 7.3 CONCLUSIONS

1. Under Zambia's Fourth National Development Plan (1987 - 1991), and within the framework of the United Nations International Drinking Water Supply and Sanitation Decade (IDWSSD), the target water supply coverage is to reach 100 per cent of the urban population and 50 per cent of the rural population. Thus the MDC/NORAD-supported Western Province Water Supply Programme is directly relevant and in accordance with national objectives. However, the implementation plan needs to clearly define the activities at district level and at community level. Furthermore, the Programme should liaise closely with national authorities so as to define clearly the objectives of water supply with respect to quantity, quality and convenience of supply.
2. The objective of the Programme with respect to strengthening the role of women in water activities is strongly supported by one of the national objectives of promoting and improving the role of women in national development activities. However, the implementation plan should address this objective and give clear guidelines for provincial, district and local level activities.
3. The Programme has extended relatively safe water supply to the poorer sections of the community in Western Province. The remoteness of the project areas, and the relatively difficult access, would have denied such development to these communities in the current severe economic situation in Zambia. Thus the Programme is helping promote socio-economic development in the poorer sections of the Zambian community.
4. The Programme has not yet achieved self-reliance in operation and maintenance, more especially with respect to rural water supply. The reasons have already been mentioned, and the basis has now been laid, in Phase IV, to tackle the problem.



## 7.4 RECOMMENDATIONS

1. The Programme needs to have clearly defined and mutually approved implementation plans for technical, financial, and manpower components of the Programme. The Programme staff should develop such plans without delay.
2. An operation and maintenance programme should be elaborated by programme staff jointly with the district councils who are mandated by the decentralisation policy to be responsible for operation and maintenance.
3. The current social and economic situation in Zambia is likely to lead to drastic cuts in the budgets of social development programmes such as water supply. The MDC/NORAD-supported programme helps to meet the long-term development objectives of taking development to the rural poor. It is recommended that this Programme should continue since it is in accordance with Zambia's long-term development policy, and also in accordance with Norway's poverty-orientation development policy.







# CHAPTER 8

## PROGRAMME DESIGN

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### 8.1 INITIAL PLANNING

A major shortcoming in this Programme and a cause of major difficulties has been the lack of a comprehensive project document to guide the development of the Programme. The original feasibility study was largely technical with limited perceptions of the related economic, organisational, social, geographical, hydrogeological, etc. aspects of such a large Programme. This has been rectified to some extent by the introduction of an Implementation Plan and a monitoring and evaluation system.

This Evaluation has, however, revealed a clear need for an improvement in MDC/NORAD's Project Formulation system. The World Bank which has several useful models to follow, estimates that about 27 months is required between the initial identification of the project/ programme and the signing of the financing agreement. Approximately 16 months are employed in identifying and preparing the project. The principal stages of the World Bank project cycle are as follows:

- Identification
- Preparation
- Appraisal
- Negotiation
- Implementation
- Supervision

In the case of a specific Programme, the identification and preparation work, which would include a considerable amount of detailed engineering, would be the responsibility of the recipient country, while appraisal would be the responsibility of the donor. If the appraisal demonstrated that the Programme was worthy of external support, then the Programme would be negotiated and implemented by the recipient with the assistance of the donor organisation.

The present Programme was negotiated on the basis of a feasibility study carried out by representatives of the donor organisation only, and was clearly far from comprehensive enough to justify – or even predict – the scope of activities necessary to reach the ambitious target implied. The actual feasibility studies, however limited, were initiated after the bilateral Agreement was signed and the premises for the Programme laid down.



## 8.2 IDENTIFICATION OF NEEDS

One of the most important aspects of the Programme has been the extent to which its design and implementation has succeeded in meeting the needs of the Programme's various target groups. It is not usually difficult to measure whether a Programme has been able to meet the needs of the target population in direct physical terms i.e. the number of schemes constructed, the number of persons served etc.

However, it is considerably more difficult to assess, how far the needs have been satisfied in quality, that is the needs as expressed consciously and otherwise by the recipient target populations. The question is therefore what mechanisms and what elements of the Programme design have been employed to express, measure and articulate the needs of the target populations, and has the Programme design subsequently been such that these needs have been met?

## 8.3 TOWNSHIP WATER SUPPLIES

In densely populated townships where the population is growing steadily, the need for improved water supplies is much more obvious than in the rural areas near the flood plain. Generally, there is therefore less need to identify and articulate the particular needs of the urban population, while this is a major concern in rural water supply programmes.

No special measures, therefore, were taken to investigate the socio-economic situation in the townships or the needs of the people when the Township Water Supply Programme was started. Distribution of water was not a part of the Programme. Since the reticulation system already existed, the Programme was largely a technical undertaking: to construct new water supply plants for the townships.

The design of this Programme component is acceptable, in so far as the Programme has succeeded in meeting the needs of the population as to quantity and quality of water. There have clearly been minor technical problems (referred to in chapter 2) in connection with reticulation, corrosion and design. These are in the process of being rectified and have not had a serious effect on the needs of the recipient population.

Certain aspects of the township supplies related to hygiene at the communal standpipes in high density urban areas, and urban sanitation have been unsatisfactory. One may argue that these aspects should have been included in the Programme Agreements from the very start. However, new studies on the needs for sanitation are now being initiated, which might result in activities that will eventually solve these problems.

## 8.4 RURAL WATER SUPPLIES

In the course of the implementation of the Programme, there appear to have been four mechanisms or systems used for expressing and articulating the needs of the Programme's target populations. These have been as follows:

- the plans and designs for the Programme
- the system of consultation with District and Provincial authorities evolved at the beginning of the Programme
- the Provincial and District WASHE Committees
- the Community Education and Participation (CEP) system



## Plans and designs

The preliminary Feasibility Study discussed briefly the potential benefits of the Programme, and also its ability to meet needs of the population. It is emphasised that the benefits cannot be quantified in monetary terms, and that cost/benefit considerations therefore cannot be calculated.

However, by implication the Report states that the needs of the target population are for improved health and for time savings, and that the Programme will probably meet such needs. It is also implied that the Programme may contribute to certain economic needs of the population by making possible industrial development and other complementary development.

The Feasibility Study proposes that economic considerations be given priority in selecting water schemes on the basis of a least-cost approach in order to maximize the benefits from the Programme to as many people as possible. The Study also recommends that water schemes be given priority in areas of high economic potential, e.g. where a market centre, a school or a health centre already exists.

The various Agreements for the Programme make little reference to the needs of the target populations. No direct provision is made in the Phase II and Phase III Agreement for any mechanism which will articulate the needs of the target populations. A very brief reference is made to the objective that the Programme will reach as many people as possible. The Phase IV Programme Agreement however, makes specific reference in its objectives to a Community participation system which will be involved in the planning, implementing and maintaining of water supply facilities under the Programme.

## The initial consultation system

In the period prior to the start of the Programme, it appears that the Provincial Water Engineer had a formal obligation to consult the local communities on the location and design of rural water supplies. This was done through the District and Provincial administrations. Lists of proposed schemes were drawn up by District Councillors in consultation with their constituents. These lists were submitted to the District Development Committee and the Provincial Development Committee for approval. The approved schemes were then implemented by the PWE's office.

In the Feasibility Study it was suggested that a preliminary study should be made by PWE before new development schemes were approved. The study should include:

- Investigation of possible ground water sources for the proposed project
- The optimum technical/economic limits of supply for the proposed project
- Review of expected health and social benefits

With the results of the study at hand, it was suggested that DWA should prepare a revised priority list with justifications, which should be submitted to the Development Committees at provincial and district level before projects were implemented.

There has been some disagreement about how the system of local consultation described above actually worked in practice. The Evaluation Team was frequently informed that schemes were selected on a political basis by the councillors responsible and that little attention was paid to social factors, health, hydrogeology and to identify needs.

Because of the autonomous status of the project in relation to PWE, however, the preliminary studies of needs and subsequent negotiations with local authorities did not take place as suggested. It was also said that the drilling teams themselves frequently sited wells without consulting the local councillors and sometimes ignored local traditions and customs in doing so.



It is difficult to know the truth at this distance in time. There is, however, no doubt that an attempt was made to adopt a system of consulting the local population through their representatives on where to locate the wells under the Rural Water Supply Programme. Because of the least-cost criterium being used, the Programme in its initial years may have failed to address the needs of those most in need, since many of them live in remote and less densely populated areas where development costs of water supplies are relatively higher because of unfavourable hydrogeological conditions.

It has been established, nevertheless, that two third of the boreholes and one third of shallow wells constructed by the Programme have been located in conjunction with public institutions like schools, markets, dispensaries etc, where there is a definite need for clean water.

## **The Provincial and District WASHE Committees**

The Water, Sanitation, Health Education (WASHE) Committees have been formed since 1984 at provincial (P-WASHE) and district (D-WASHE) level in order to promote inter-sectoral co-operation in the Province. The initiative to establish these Committees has come from Provincial level and from a perceived need to improve co-ordination between those bodies involved in the water sector in Western Province. The P-WASHE Committee, chaired by the Provincial Permanent Secretary representing both political and administrative structures, is constituted by representatives from medical, agricultural, education, planning, social development, works and supply and the Department of Water Affairs.

The P-WASHE Committee has been active in establishing the basis for a workable, intersectoral community participation and community education programme to support the Water Supply Programme. As such the Committee has been a very important mechanism for mobilising and articulating the needs of the target populations. Otherwise the principal objectives of the Committee have been to:

- promote improved health and social conditions in the Western Province
- to improve the situation of women and children
- promote self-reliance in terms of organisation, manpower and financing

Additional specific objectives have been the importance of involving the community at all project levels from planning to operations and maintenance. In addition training and education is an important part of the P-WASHE brief.

The D-WASHE Committees are only now getting off the ground in the Districts. They appear to have the potential of mobilising opinion at the grass roots and in articulating the needs of the population so as to improve the overall design and implementation of the Programme.

## **Community education and participation**

At the initiative of the P-WASHE Committee, a Team to promote Community Education and Participation in connection with the Western Province Water Supply Programme was established within the Programme in April 1985. The initiative came about at the request of several provincial departments and of MDC/NORAD. A total of 10 staff have been recruited to the CEP Team over a period of 18 months with personnel from the Ministries of Health, Agriculture and Education. The Team is led by a medical doctor, and now comprises an artist, health inspector, health assistant, health educator, enrolled midwife, agricultural assistant, nutritionist and home economist. Each Ministry is responsible for salary and housing of the individual officer and a strict policy is observed to ensure that conditions of service are in accordance with the policies of the Zambian Government so that continuity can be maintained by the Government after the Programme is completed.



The basic purpose of the Team has been to articulate the needs of the target populations and to incorporate these into the design of the Programme. In this respect the Team is virtually unique in Zambia and could be a forerunner to such institutions in other provinces of the country.

It seems likely that the idea and establishment of the Team now has emerged in response to the development of the Programme. After 8 years or so of development, it was becoming more and more evident that greater community participation, on an inter-sectoral basis would be required if the Programme was to succeed and continue to reach its target populations, particularly in the rural areas. It is therefore important to devote some space to the functioning of the CEP Team.

## **8.5 THE OPERATIONS AND PERFORMANCE OF THE CEP TEAM**

Although it is relatively new to the scene, it seems important to review the operations and performance of the CEP team so far and its prospects for the future, as a mechanism for mobilising the population to be able to express their needs as far as the Water Supply Programme is concerned.

### **Objective**

The stated objectives of the CEP Team are:

- co-ordination between the Provincial Medical Officer's (PMO) office and the PWE concerning all aspects of CEP in the Rural Water Supply Programme
- design and implementation of training programmes for the CEP aspects of the Rural Water Supply Programme
- setting up of a monitoring and evaluation system

The Team Co-ordinator works through the PMO Office and its primary health care system and health education unit. In addition, the team works through local, traditional and community leaders, health centre staff and schools and extension staff and village health and water committees where these exist.

The most immediate function of the CEP Team is to interpret the needs of the recipient populations for the Western Province Water Supply Programme. This it does by carrying out the following tasks (largely in the field):

- promoting the formation of District WASHE Committees to guide the implementation of improved water supplies in their respective districts.
- to assist in the identification of priority areas for the provision of water supplies
- to discuss the provision of water supply with the villagers
- to provide health education in the schools, especially with relation to clean water
- to co-operate with and establish liaison between the drillers and the local community during construction work



Work has just begun on establishing D-WASHE Committees in the Districts and the response so far has been variable. However, some progress has been made, and the idea of the D-WASHE Committee and its functions are gaining wider acceptance.

## Identification of needs

Solid progress has been made in identifying priority areas for the provision of water supplies. A detailed selection criteria form has been worked out and District representatives have been instructed in how to complete this. At Ward level, the Ward Chairman, the local health assistant or other extension assistants have been instructed how to fill out the form. This has gone a long way to establishing a neutral and fair method of identifying priorities as between communities. The system is easily comprehensible to the villagers.

Criteria listed for 51 villages given a water supply and 21 villages not qualifying were examined by the Evaluation Team. The table below indicates the number of villages who scored on the different allocation criteria, and percentage.

Significant differences were noted in the presence of public institutions like health centres, schools and markets, which is in agreement with the justification for the Programme given in the Feasibility Study in 1976. At present, 31 of 86 rural health centres have water supplies. Other significant factors were in the total number of households in the village, and the willingness and ability of the community to work together and contribute to the project.

	Approved (%) N=52	Not approved (%) N=21
<b>Water need</b>		
Insufficient supply, dry season	45 (87)	16 (76)
Insufficient supply, wet and dry season	6 (12)	2 (10)
Quality considered bad by users	43 (83)	18 (87)
Health hazard sometime	36 (69)	17 (81)
Health hazard all the year around	16 (31)	4 (19)
Distance 15 - 30 minutes	36 (69)	13 (62)
Distance more than 30 minutes	9 (17)	2 (10)
<b>Development potential</b>		
Local court, market, depot, etc.	14 (27)	1 (5)
Health centre, school	13 (25)	-
Crops, income generating	37 (71)	15 (71)
<b>Technical feasibility</b>		
No. of households 15 - 30	17 (33)	13 (62)
No. of households more than 30	35 (67)	5 (24)
Nearest service area 5 - 10 kms	15 (29)	8 (38)
Nearest service area less than 5 kms	29 (56)	7 (33)
<b>Social feasibility</b>		
Felt need by people	51 (98)	20 (95)
Willingness community participation	44 (85)	19 (91)
Community work together	27 (52)	-
Accept responsibility maintenance	30 (58)	10 (48)



## Contacts with the communities

The CEP Team discusses the provision of a water supply with the local community and their representatives before any water supply scheme is installed. This is critically important for the co-operation and understanding of the recipient community. Through these visits the CEP Team can check and confirm the findings from the selection criteria process. The willingness of the local community to co-operate in the construction and maintenance of the supply can also be checked.

Finally the Team usually takes the opportunity to demonstrate the relationship between clean water and health, and to assist in the formation of a village water committee which will be crucial in the implementation of the scheme. In this process extension workers, health assistants, teachers and community leaders are encouraged to take an active part and it is hoped they will be able to take over the CEP Team's role at District and Ward level. The CEP Team normally makes two or three visits to each village where construction is to take place. Health education is given in the schools by two CEP health educators from the Ministry of Education. Instruction is over a period of 1 week and through song and drama and child to child programmes for the younger children. Emphasis is on practical approaches e.g. general hygiene practice, making of oral rehydration salts etc. Some 15 schools have been covered to date and this seems a very promising venture for long-term health education.

With the advent of a new type of drilling technology with which local communities are not familiar it has become important that the CEP team provide a liaison between the drilling team and the local community.

It has been suggested that three CEP workers should be assigned to the three drilling teams in operation at any one time. The CEP Team estimate that they can currently cover up to 20 installations a month which is more than the drilling teams currently have capacity for. In fact, during 1986, the CEP Team were able to keep well ahead of the drilling teams and to prepare the village communities adequately for the advent of the drilling/ construction work.

After the borehole has been constructed, the CEP team ensures that the pump installation team teaches the villagers how to install the pump, and simple maintenance. The CEP Team also provides the Village Committee with registration forms to provide a continuous record of use and maintenance of the installed water supply. These are completed with varying degrees of efficiency and this is part of the monitoring and evaluation system of the Programme.

The CEP Team also try to follow up by visiting the water supply and its community every two months after installation for a limited period. Visits were curtailed in 1986 because of lack of transport.

## Training

Although field work is probably the most visible aspect of the CEP Team work at the moment, the CEP function has an important training role. Curricula are currently being developed for instructor's training at provincial level and training of trainers at District level and for possible inclusion in teachers' training programmes and schools. Guidelines have been prepared for Village Water Committees and there are prospects of developing training programmes for these Committees.

The CEP Team has held 12 formal training sessions in 1986. These have been held to promote the formation of D-WASHE Committees, and to brief drillers, installers of hand-pumps, drivers and supervisors. Health education training for CEP staff has proved useful and health education materials have been developed and field tested with the help of an artist who converts the ideas of the CEP Team members into appropriate images. These materials are a resource for the health educators.

It should be recalled that the CEP concept is still in a pioneering stage. Much has still to be sorted out. For example individual members from different disciplines must learn how to work together to the best of mutual benefit and how each team member can maximise the contribution from his/her own professional background and experience



e.g. the CEP agriculturalist could assist on extension in connection with water supplies while the medical staff could work more closely with the traditional healers and birth attendants.

So far the CEP Team has not ventured into the field of urban water supplies although it is recognised that there are very considerable problems in the urban sector awaiting solution, and that the current CEP team was well equipped to deal with them.

## **8.6 CONCLUSIONS**

1. The Township Water Supply Programme has by and large succeeded in addressing the needs of people in the township areas. Nonetheless, there is a need for extensions of the Programme in certain critical areas as hygiene and urban sanitation within low-cost and squatter areas.
2. During Phases I-III the Programme did not concentrate on those parts of the population who are most in need for safe water. Nevertheless, half of the rural water supplies have been constructed near public institutions where there is a recognised need for improved water supplies.
3. It was only in 1985 with the establishment of the WASHE Programme and an active interest in the Programme from the Provincial authorities, that a mechanism for taking account of the needs of the population was developed. This mechanism is the Community Education Participation system (CEP) which has been developed for the Programme.
4. The introduction of the CEP function into the Programme has been a useful tool in promoting water development in Western Province. Its achievement is to articulate the needs of the recipient population, to act as an agency for general health and community education, and to provide a link with and evidence of Government's concern for the rural areas.
5. The CEP system is still in a pioneering stage and it is too early to assess to what extent it is successful. In practice, the CEP team has managed to become heavily involved in local communities and to identify water development with community development. It has taken up a vital role in health education, teaching self reliance and monitoring the results of the Programme.
6. The WASHE Committees and the formation of CEP teams is an important initiative in intersectoral cooperation, and could provide a model for other Provinces in Zambia.

## **8.7 RECOMMENDATIONS**

1. Work should continue to develop CEP teams at district level, working through the D-WASHE committees.
2. The objectives of the CEP team should be expanded to include improved health and social conditions resulting from improved water supplies.



# CHAPTER 9

## SUSTAINABILITY

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### 9.1 GENERAL

It is explicitly stated in the Norwegian Government's White Paper on Development Assistance (St. meld. nr. 36 (1984-85)) that development projects should be designed in such a way that the recipient countries are able to sustain the development activities in the long run, after external assistance has been terminated.

In practice, this is largely a question of training national personnel at various levels for taking over the responsibility. It also means gearing the scope of project activities to a realistic level that can be sustained with national resources. Moreover, it requires that the technological level is appropriate and compatible with existing skills and the prevailing level of economic development in the society.

The economic development of Zambia has been marked by the increase in oil prices since 1973 - 74 and a dramatic decline in copper prices which has continued until to-day. Over the last 15 years there has been no increase in Zambia's gross domestic product in real terms.

Since 1974, Government recurrent expenditures have been kept at the same level in real terms, while capital expenditures have dropped to 1/4 in the same period. The underfunding of recurrent operating expenditures has contributed to a widespread decline in the effectiveness of Government services and lack of maintenance of economic infrastructure.

### 9.2 TOWNSHIP WATER SUPPLIES

#### Scope

As shown in chapter 6, the scope of the township supply component as envisaged in the first Programme Agreement was very limited compared with the systems that were actually constructed. During Phase I of the Programme, when engineering designs were eventually made and the budgets calculated, the scope of the programme was increased dramatically to tally with the per capita water consumption figures suggested by the Government. The Programme was not deliberately designed so that operating costs would match the actual repayment potential of the consumers.

In the present situation, the operation and maintenance costs of the schemes by far exceed the actual available revenues. A study done by DWA in September 1986, suggests that the water tariffs will have to be raised substantially over the next 5 years in order to meet the estimated operation and maintenance expenditures. Even



then, the recovery of all costs (including depreciation of investments and interests of capital), will only be 10 - 20 per cent.

In the current economic situation, with a permanent shortage of Government funds for recurrent expenditures, it is unrealistic to imagine that the water supply systems constructed under the Programme can be operated and maintained in the coming years without support from outside.

This situation might have been taken into consideration during Phase I of the project when the scope of the Programme and the capacity of the schemes was decided, since the decline in the economy was already evident as was the shortage of Government recurrent funds. However, it should be noted that the major blow to the possibilities for cost recovery came after mid. 1985 as a result of devaluations of the Kwacha, which could not have been predicted at that time.

## **Technology**

In terms of operation, maintenance and its sustainability, the technology selected for the 8 township supplies is relatively simple and reliable, and does not require highly qualified technical personnel.

## **Training**

A training centre was established in the initial phase of the Programme. Altogether 500 man-months training has been provided since it was started, and 57 candidates have passed trade tests. All candidates are employees of the Provincial Water Engineer, and have remained in the service after training has been completed.

Up to 1984, training was given to water plant operators only, for a period of 3-4 months. A few of the trained operators have proceeded to the National Water Plant Operators Course in Lusaka for a period of 15 months. After the training course started in Lusaka, the training centre in Mongu has been used for training traditional crafts; Plumbers, mechanics, brick-layers, carpenters etc. In 1986, training activities were also extended to health workers, community workers etc.

The issue of training was addressed by the Project Review Team in 1984. The Mission emphasized the importance of training in institution building, and for the continued operation and maintenance of facilities in the future. It was mentioned that planning of manpower development and training had not reached the stage it deserved within the project.

A short-term consultant on human resources development (HRD) visited the project in January 1986. In his report it is emphasized that steady progress is being made to strengthen HRD, and the project staff are to be complimented in this regard. However, an up-to-date manpower development plan is lacking in the project. It is also stated that the majority of supervisory personnel had not been trained as trainers, and that the quality of on-job training therefore is questionable.

There are two major issues affecting the sustainability of the Programme at stake here: To Zambianize the project entirely as soon as possible, and to prepare for the decentralisation of the Programme along the lines decided by the Zambian Government.

In the current situation both the PWE and the District Councils have a shortage of trained personnel, not only at the artisan level, but also at the professional and sub-professional level. The need for further recruitment and relevant training of DWA staff at professional levels through scholarships financed within the Programme was raised in 1982 and 1984, but has so far not given noticeable results, apparently because of the overall shortage of technical staff in Zambia.



The Project Review Mission in 1984 emphasized that each of the expatriate supervisors should look upon himself as a trainer. This obligation has now been stated in the job descriptions of the expatriate staff, but still there is some way to go before training of local staff receives enough attention in the day-to-day work. Although the need for training might be in conflict with the desire of expatriate staff for efficiency, it should nevertheless be given high priority in order to address the overall objective of institution building and future self-reliance.

## 9.3 RURAL WATER SUPPLIES

### Scope

The Rural Water Supply Programme represents a major input to the budget of PWE and in fact to the whole development budget for the Province. It also represents a major build-up of personnel. Of the 480 individuals employed permanently or temporarily by PWE, 130 are linked directly to the Rural Water Supply Programme and paid from the NORAD grant directly.

This is a temporary solution that was chosen in order to meet a production target and is clearly not meant as a permanent institution. The recurrent funds of the PWE would only allow for a small part of the staff to be maintained when Norwegian funds are no longer available for the Programme.

It is necessary, therefore, as soon as possible, to prepare for a situation where activities related to the construction of shallow wells, and maintenance and repair of rural water supplies to a larger extent can be handled at district level, through a necessary transfer of personnel from provincial level to the district levels.

### Technology

It will be recalled from what is said in chapter 2 above, that initially, the rural water supply component was seen as a continuation and expansion of on-going development of water supplies in the rural areas done by the PWE. The idea was to construct shallow boreholes with handpumps. The boreholes were to be sunk by percussion rigs or developed using a jetting method. In the early years of the project, boreholes were developed with the use of percussion rigs, and shallow wells were dug by hand. Because of the techniques used, a number of problems were encountered. In 1986 rotary drilling rigs were introduced in the Programme, in replacement of previous methods.

Although such equipment have many advantages in terms of production time and capacity, it represents another order of sophistication in terms of technology compared with the previous systems. The operation of such rigs require a more advanced back-up system than percussion rigs, and is more dependent upon inputs from outside in terms of technical assistance, spareparts and consumables. In the foreseeable future it could not be operated from the district level.

It is important in the future, in a perspective of decentralisation, to diversify the choice of technology in order to involve the districts more closely in the Programme, and make it possible to transfer people from provincial level to the district where a Rural Water Supply Programme can be sustained at a continuing level. The use of highly mechanized technology at provincial level should be limited as much as possible, e.g. to the areas where the hydrogeological and geological conditions require deep borehole drilling.

## 9.4 OTHER ISSUES

Since its inception, and throughout Phase I - III, the Programme has operated rather independently of DWA and the Provincial administration. The reasons are numerous. It appears at the outset that there was limited



understanding on the Norwegian side of the existing institutions within Zambia for water development. Because of the lack of experience from Africa on the part of the consultant and the experts, there was a tendency to ignore or over-ride existing Zambian institutions.

In general there is a pressure to perform technically against short-term objectives in many development projects. This seems to derive from an overall philosophy of limited but effective assistance with withdrawal as soon as the production target has been reached.

There is evidence to show that there has been a strong tendency in the Programme to try to circumvent the existing system for the sake of productivity and efficiency. This has been done at the expense of long-term targets like institution building and integration, which is necessary in order to sustain development in the future. Similarly, it means the Programme in its initial years has built up a "dependency syndrome" which is difficult to dismantle quickly without causing major problems of disruption.

Because of the short planning horizon and the continual concern for technical performance, not enough attention has been paid to the training of engineers and professionals who can take over the system. The training component has rather been geared towards the production of technicians who can operate the system and maintain the transport function.

Important steps were taken in 1984, however, towards multi-sectoral cooperation under the WASHE-Programme in which the Water Supply Programme is a major component. The Programme has thus been successful in achieving a degree of integration into the existing administrative system.

The overall decline in the economic situation in Zambia has resulted in drastic reductions in conditions and salaries of Zambian staff. Low salaries, poor housing conditions and escalating prices have combined to affect the morale and performance in general, while expatriate staff is not affected by this.

In the current situation it seems important to increase staff incentives in order to motivate staff to higher performance and avoid the Programme losing some of its key staff. As salaries are governed by Government regulations, other incentives than salaries have to be sought. These could be the construction of staff housing and the provision of funds for professional training.

Few of the programme staff are housed by Government. Most have to find private rented accommodation and some even in temporary tented accommodation.

With the perspective of decentralisation in mind, it would probably be a good investment to embark upon a construction programme of 150 - 200 low-cost houses in the provincial and district headquarters. Such houses would be simple structures of no more than 30 square meters with access to pit latrines and communal water stand pipes. With a cost of about ZK 1,500 per square metre, the total cost would be in the range of ZK 7-9 million

Such a construction programme might give important spin-offs in the area, since a major problem in Western Province today is the lack of a building industry and building tradition.

## **9.5 CONCLUSIONS**

### **Township water supplies**

1. The technological level adopted in the Programme is appropriate in terms of sustainability of the Programme.
2. The present recovery of operation and maintenance expenditures through water tariffs is far from sufficient. In



the present economic crisis it is expected that external funds will be necessary in order to secure continued operation of the schemes in the coming years.

3. There is a need to strengthen both formal training and in-service training of personnel at professional and sub-professional level, in order to prepare for the **Zambianization** and decentralisation of the Programme.

### **Rural water supplies**

4. The drilling programme in the rural areas at its present technological level, given the rather high foreign exchange component, is seen as a temporary programme which is initiated to reach a specific production target (800 boreholes) in areas where such equipment is justified.
5. The drilling equipment now in use can be operated and maintained only at provincial level. The hydrogeological conditions in Western Province, however, are such that a large proportion of the rural population could be served by low-technology, hand dug shallow wells which could be constructed by a programme operated at district level.
6. In the initial phases, the Programme has been guided by short-term production targets, while long-term needs of institution building have not received enough attention. During the last two years administratively good progress has been made towards integration into the **Zambian system**.

## **9.6 RECOMMENDATIONS**

1. Norway should provide continued support for operation and maintenance of township supplies for the coming years, within a planning horizon of 10 years. It is recognised that considerable advances have been made in revenue collection. However continued support to the Programme should still be contingent on continued efforts to achieve a reasonable correspondence between the consumption of water of the different consumer groups and actual waer charges collected.
2. Norwegian assistance to the drilling programme should be discontinued when the production target (800 water supplies) has been reached, unless areas are identified where there is need for improved water supplies which can be developed only with deep borehole drilling.
3. In the continuation of the Programme, within a planning horizon of 10 years, an increasing proportion of programme funds and resources should gradually be diverted into a decentralised rural water supply programme under the District Councils. At the same time personnel from PWE should be trained for such operations and transferred to the districts.
4. A comprehensive programme for human resources development at various levels should be drawn up in order to cater for the needs for trained personnel necessary to effect **Zambianization** and decentralisation.
5. Measures should be taken to provide incentives to national programme staff in district and province headquarters, e.g. through construction of low-cost staff houses.







## **CHAPTER 10**

# **FUTURE STRATEGY AND NEEDS**

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As mentioned before, two central themes in the future of the Programme are the need for greater decentralisation of the Programme, and the need for greater integration of the Programme into the Zambian administrative and financial system. A future strategy should be based on these dual themes. It should be supported by a number of measures aimed at devolving responsibility to the District level, at providing greater resources for training at professional level, for improving staff conditions, and for improving financial accountability.

### **10.1 DECENTRALISATION OF THE PROGRAMME**

The current decentralisation policy introduced by the Zambian Government through the Local Administration Act, 1980, is expected to have far reaching consequences not only for the political/administrative structures but also for the design of individual projects in the future.

A main feature of the decentralisation policy is the formation of District Councils (DC) which is intended to institutionalize a shift of responsibility for the implementation of development programmes in the rural areas from provincial (and national) level to the district level.

The scenario depicts a future decentralised system where ministries and departments with sectoral responsibilities, like agriculture, water, health, etc. are no longer responsible for local development below provincial level, and will not have extensions at district level. The responsibility will rest with the DC's, which will be the only authorities authorized to raise revenues for local development activities and operation/maintenance of existing installations.

In the future, assuming that the strengthening of the local government gains momentum, present organisational solutions will have to be revised accordingly. This also applies to externally financed development projects. It is of particular importance that bilateral donors take note of these developments and take the necessary measures to avoid externally funded projects violating government policy.

The decentralisation policy will no doubt have important implications for a water supply programme like ZAM007, which is at present implemented largely from provincial level.

#### **Township water supplies**

Six of the eight township water supplies (except Mongu and Limulunga) are presently operated by DWA at district level through DWA officers in charge, and with operation and maintenance costs covered partly by DWA directly, and partly by water tariffs collected by DWA in the district townships.



In the future, these responsibilities are expected to be taken over by the DCs. Under the new decentralisation policy, one of the main responsibilities of DWA will therefore be to train technical personnel for operation and maintenance of the township supplies, which will eventually be employed by the DCs under the District Water Councils. The DCs will have the economic responsibility, and costs will be covered by revenue collected, supplemented by deficiency grants by the Central Government where needed.

In the future DWA is not expected to operate directly in the district. The role of DWA at provincial level will be largely in planning and advisory services, major repair of installations in the districts and more sophisticated developments (piped supplies, deep borehole drilling, dam construction etc.).

The district administrations are far from prepared for this situation today. The present experience is that in the two townships where the DCs are responsible for the water supplies (Mongu and Limulunga), they do not yet have the technical capacity to handle operation and maintenance of the schemes. An initiative has therefore been taken to hand over the responsibility for Mongu township supply to DWA, apparently as a temporary measure. This will, however, not conflict with the overall long-term decentralisation policy.

Future Norwegian support to the township water supply component in the Programme is justified on the grounds that 90 per cent of the investments already had been made by the end of 1986 (Figure 10.1, refers), and further support for operation and maintenance from external sources is necessary to ensure that the benefits from these investments are realized. The Evaluation Team has therefore recommended that funds are set aside for this purpose, and that a planning horizon of ten years before complete take-over is adopted. Such funds should be provided on the condition that necessary measures are taken to ensure a just and efficient system of collection of water tariffs that reflect the actual consumption of water by the different consumer groups.

In an intermediate phase, emphasis should be put on the strengthening of the districts for their future role in water supply operation and maintenance, in particular through training of technical personnel that can be assigned to the districts. In the wider perspective, the Norwegian component should be limited to a minor financial support to the DCs for spareparts, chemicals, etc., which require foreign currency inputs. The delivery could be ensured through DWA at provincial level.

In addition, funds should be allocated directly to the DC in Mongu township in order to establish a pilot programme for upgrading of the communal taps with aprons and run-offs, construction of improved latrines, and health education. The programme should be confined to the squatter areas. Since it would represent an integrated approach, such a programme would also provide a useful test for the District WASHE Committee. Both the performance and the benefits of the pilot programme should be carefully monitored. It might then eventually, after having been evaluated, be repeated in other townships in the Province.

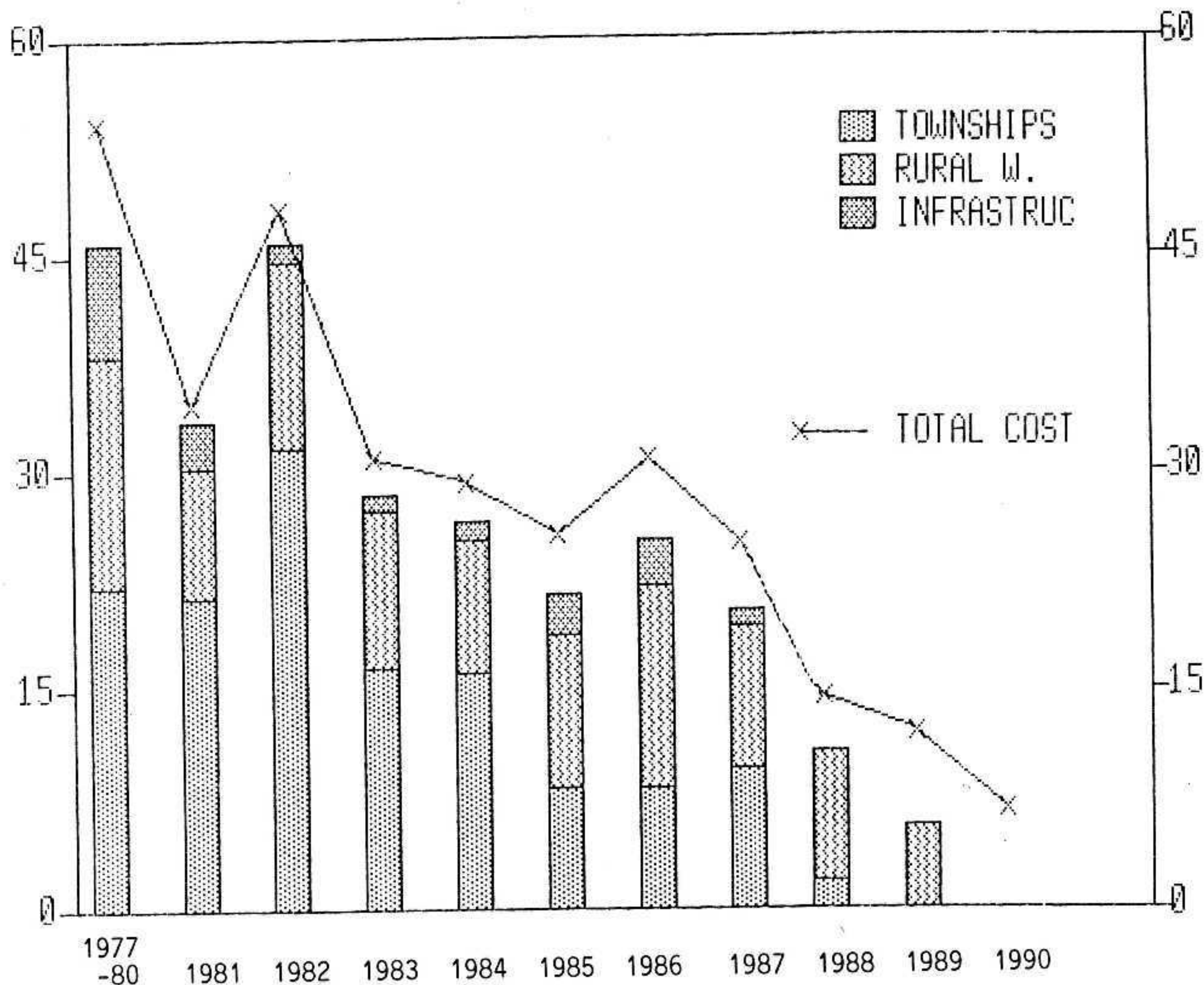
## **Rural water supplies**

Within the framework of the Programme, rural water supplies are presently being constructed mostly by DWA at provincial level. The role of the districts has been limited largely to the identification of locations for new water supplies, and maintenance work.

Under the decentralisation policy, the target is that the DCs shall be responsible for the implementation of rural water supply projects, for identifying the needs, financing, organizing community participation and health education, and construction. The DC would also be responsible for organizing maintenance and repair of existing installations.

Given the current technical and financial constraints in Zambia, the resources available to the districts in the nearfuture are expected to be very limited. A build up of implementation capacity in the districts will therefore have to be based upon the use of simple technology, e.g. the construction of hand-dug or jetted shallow wells with hand-pumps (which is assumed to be appropriate in those parts of Western Province where the majority of the population live and the ground water resources are easily accessible).





	1977-8	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	SUM	PER CENT
TOWNSHIPS :	22.2	21.5	31.7	16.6	16.3	8.4	8.4	9.7	2.0	0.5	0.0	137.1	43
RURAL W. :	15.9	9.0	13.0	10.8	9.1	10.5	13.9	9.6	8.8	5.8	0.0	106.3	34
INFRASTRUC :	7.9	3.1	1.3	1.2	1.2	2.7	3.1	1.1	0.1	0.1	0.0	21.8	7
O/M RECURR :	1.7	0.7	1.9	2.0	2.0	2.9	4.5	3.6	2.8	2.4	0.0	24.4	8
MISCELL. :	6.7	0.6	0.5	0.8	1.1	1.6	1.4	1.4	1.0	3.5	7.0	25.5	8
<b>TOTAL COST :</b>	<b>54.4</b>	<b>34.9</b>	<b>48.4</b>	<b>31.3</b>	<b>29.5</b>	<b>26.0</b>	<b>31.3</b>	<b>25.4</b>	<b>14.7</b>	<b>12.2</b>	<b>7.0</b>	<b>315.1</b>	<b>100</b>

FIG. 10.1 Programme investments, actual and budgetted 1977-1989

The use of more mechanized technology, e.g. drilling rigs, which need technical back-up at a far more advanced level, will most probably have to be referred to DWA at provincial level also in the future. Clearly the hydrogeological conditions in some parts of Western Province are such that rural water supplies can only be developed by the use of such technology. The building up of some drilling capacity at provincial level is justified on these grounds. But it is also evident that an over-emphasis on advanced technology at provincial level will tend to exclude the district level from participation, and is therefore contrary to Government policy in the long run.



The rural water supply component of ZAM 007 has so far only concentrated on the provincial level, and has resulted in a major build-up of personnel and technical capability under PWE, notably the recent investments in drilling rigs. In order to overcome some of the organizational problems encountered so far, a separate unit has been established in order to address the needs for community participation and health education, also under PWE.

In order to respond to the emerging decentralisation policy in Zambia, however, emphasis should be on training and transfer of DWA personnel to the districts, in order to initiate a rural water supply programme under the DCs. The same would apply to personnel presently assigned to the community participation and health education unit. The role of DWA at provincial level would in the future be limited to advisory services (e.g. in hydrogeology, hydrology and technical design), and the operation of drilling rigs in those areas where the geological conditions require deep boreholes.

The Norwegian commitment in time to come should reflect this perspective, and initiatives should be made to prepare for a decentralised programme which is fully integrated into the Zambian system.

This will require a strengthening of the training component of the Programme, and a gradual shift of resources from DWA at provincial level to the DCs, in order to initiate a programme for shallow wells and improvement of existing wells in the districts organized directly under the DCs. Financial support might be channeled directly through the Ministry of Decentralisation. This would result in a corresponding build-down of the Rural Water Supply Programme at provincial level.

## **10.2 INTEGRATION OF THE PROGRAMME**

### **Human Resource Development**

Provision for the technical and financial needs of the Programme up until the end of 1989 is made in the Phase IV Agreement and the Implementation Plan of March 1986. About NOK 69.5 million is allocated to complete the township supplies Programme and to complete some 800 operational wells. It is proposed to reduce the number of expatriate positions on the Programme from 9 to 3 by the end of 1988. In the meantime, Zambian staff will be recruited to 4 top positions within the PWE's Office.

A comprehensive and well thought out implementation plan for Programme development therefore already exists. Also a man-power inventory for DWA in the Province and the districts exists and is being used for planning purposes. What is now required, is a parallel staffing and establishment plan which will ensure a smooth transition from the development to the operational phase of the Programme, in the perspective of the new decentralisation policy. A detailed Human Resource Strategy and Plan is therefore required.

Such a plan will have to be based in the first instance on the technical and financial provisions of the Implementation Plan of March 1986. The tasks and personnel functions required to fulfil the Plan and the subsequent operations and maintenance phase should be described. This will include detailed job descriptions, including required professional qualifications. Detailed training and professional development requirements for the Zambian staff should be identified, as well as for expatriate staff required to fill vacancies and functions where no adequately trained Zambian is available.

Also the number and cost of required training fellowships associated with the Programme's development should be specified, indicating where such fellowships might be taken up, whether these be in Africa, Europe or elsewhere.

It is understood that a WHO Consultant is to visit the Programme in the course of 1987 to follow up an earlier visit connected to Human Resource Development. His brief should include elements of the above.



## Incentives

Another important part of the strategy for future integration of the Programme is the consideration of staff terms and conditions. At the moment there is a number of ad hoc arrangements covering terms and conditions of different groups of staff on the Programme. Some staff members are paid from NORAD funds, some are paid from Government. Some receive overtime payment, some do not and rates are different. An attempt is being made to standardise terms and conditions and to reduce anomalies. However, an important task in the future will be to bring all Programme staff members under comparable terms and conditions within the ambit of Government Standing Orders and Financial Regulations.

As part of this exercise, consideration must be given to the question of incentives to staff to work on the Programme. Throughout its lifetime the Programme has been administered by well paid, well housed and therefore highly motivated expatriate staff. If the Programme is to be executed at a decentralised level by Zambian staff, there is a need to raise their motivation. The current wage structure and terms and conditions of employment are not sufficient to motivate Zambian staff to the same extent as the expatriates have been.

It is therefore suggested that consideration be given to incorporating simple, general incentives to Programme staff, in order to increase motivation and job satisfaction. In Western Province, because of its relatively remote location, simple, easily recognisable incentives are needed in order to attract and hold the type of staff required to operate and maintain the Programme at the current technical level of ambition.

Practical measures would be the building of sizeable housing pools for staff in Mongu and the district headquarters, which would alleviate the very difficult housing situation and make the transfer of DWA staff to the districts easier. In addition it is considered that the availability of training fellowships and a well-regulated and fair establishment system with possibilities for career advancement would do much to increase motivation amongst the national staff.







## **TERMS OF REFERENCE**

### **FOR THE EVALUATION OF ZAM 007 THE NORWEGIAN ASSISTANCE TO THE WATER PROGRAMME IN WESTERN PROVINCE, ZAMBIA**

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#### **I. BACKGROUND AND OBJECTIVE OF THE EVALUATION**

Since 1977, the Norwegian Government has supported the development of urban and rural water supplies in the Western Province, Zambia. The programme aims at providing safe water for about half the population in Western Province within 1989.

The programme includes the development of 8 township water works and 800 rural water supplies, and is part of a broader strategy towards:

- improved health and social conditions for the population of the Western Province, with particular emphasis on women and children.
- self-reliance in terms of organisation, manpower and financing.

The total Norwegian commitment up to 1989 is estimated at NOK 252 million.

The programme has been subjected to two comprehensive programme reviews; in 1982 and 1984. An outcome of this was a general reorientation of the programme in 1985. A recent country study and review of Norwegian aid to Zambia, which was completed in January, 1986, recommended that a full evaluation of the programme should be undertaken.

With reference to the agreements between the Governments of Zambia and Norway, the Ministry of Development Cooperation (MDC) will organize an evaluation of this programme in cooperation with the Government of Zambia.

#### **II. MODE OF WORK**

The evaluation will take place during the second half of 1986. It will be executed by an independent evaluation team which will include professionals both from Norway and Zambia. The team may also comprise professionals from other countries.



The evaluation team will liaise with NORAD, Ministry of Agriculture and Water Development, and the WASHE Steering Committee in Western Province.

The work will be based upon existing relevant documentation, including project reviews etc., and will comprise discussions and interviews with officials and persons concerned with the programme at national, province and district level, and will also entail field visits to villages and townships to be selected by the team in consultation with Zambian authorities and NORAD.

### **III. ASPECTS TO BE ADDRESSED**

The evaluation will assess the implementation and performance of the programme till now, and the alternative strategies that might be pursued under future phases of the programme.

In order to achieve the purpose of the evaluation, the following aspects should be addressed by the evaluation team, with reference both to the urban and rural water supply components of the programme.

#### **1. IMPLEMENTATION**

##### **1.1 Progress**

Review the programme activities in relation to goals, production targets and inputs, as these are stated in budgets, implementation plans and other relevant documents. \*)

##### **1.2 Technical aspects**

Discuss choice of technology of machinery, equipment and materials, in view of experiences with operation/maintenance, the achievements of expatriate personnel, foreign exchange requirements, employment creation, vulnerability, etc.

##### **1.3 Organisational aspects**

Consider the adequacy of institutional and administrative arrangements, including the integration of the programme within local organisations, involvement of people at community level in construction, operation and maintenance, recruitment and training at various levels, etc.

##### **1.4 Economic aspects**

Assess the costs of the programme both in local and foreign currencies, in view of the benefits of the programme at the recipient end.

#### **2. PERFORMANCE**

##### **2.1 Effectiveness**

Assess the effectiveness of the implementation process in terms of i.a. the social, economic, cultural, ecological effects of the programme, and assess to what extent the programme has benefitted the intended target groups, such as women and children.

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\*) The National Policy of Decentralisation, the Provincial Development Plan, the objectives of the international IDWSS decade, the NAC strategy for water development.



## **2.2 Efficiency**

Assess the correspondence between budgetted and real costs, and assess the real costs in relation to similiar water projects. Assess the achievements both in relation to budgetted and real costs.

## **2.3 Relevance**

Assess whether the programme has been implemented in accordance with national policies, and whether the objectives and results are justified, given the current economic and social situation in Zambia.

# **3. STRATEGY**

## **3.1 Programme design**

Discuss whether the present design, implementation and operation are in accordance with the needs of the target groups, and assess whether local participation is adequate.

## **3.2 Sustainability**

Discuss to what extent the activities initiated under the programme are sustainable after the termination of external assistance. Indicate future needs and measures (funds, expatriate and local personnel, organisation, collection of water fees etc) necessary in order to secure the continuation of the activities initiated by the programme.

## **3.3 Future strategy and needs**

Discuss the needs for future technical and financial assistance to the programme, in view of the most appropriate strategy, and indicate actions or changes necessary or desireable to enhance the effectiveness, efficiency and relevance of the programme. In particular should be considered plans for community participation, and complementary activities regarding sanitation, hygiene and water utilization.

# **IV REPORTING**

The final report will be presented to Norwegian and Zambian authorities, and should be submitted to MDC no later than February 1st, 1987.

A proposal for further reporting as e.g. inception reports, reports on particular topics, draft reports shall be prepared by the team leader and presented to the client within one month after start-up of the project.



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## ZAM 007 DOCUMENTATION AVAILABLE TO THE EVALUATION MISSION

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1	7705-31	PRE-FEASIBILITY STUDY (NIVA) (66p)
2	7912-13	POLICY PAPER ZAM 007 (in norwegian) (23p)
3	8011-14	PHASE II PROGRAMME AGREEMENT ZAMBIA/NORWAY (17p)
4	8012-29	THE LOCAL GOVERNMENT ACT, 1980 ZAMBIA (37p)
5	8109	WATER PRIZING STUDY WESTERN PROVINCE (160 p)
6	8202-01	1. PROJECT REVIEW (in norwegian) (16p)
7	8212-03	POLICY PAPER ZAM 007 (in norwegian) (14p)
8	8311-30	TRAVEL REPORT (in norwegian) (12p)
9	8402-16	TELEX FROM RES.REP. REGARDING (PHASE IV) (3p)
10	8402-17	PROJECT COORD. NOTE ON ORGANISATION (norwegian) (5p)
11	8402-23	NORAD NOTE ON PHASE IV (9p)
12	8404	M. JØRSTAD SOCIO-ANTROPOLOGISTS REPORT (70p)
13	8407	PROGRESS REPORT (13p)
14	8409	2. PROJECTS REVIEW (47p)
15	8410	1. TRAVEL REPORT AA. RØNNINGEN (100p)
16	8412-06	POLICY NOTE FROM RES.REP. (6p)
17	8412-10	NOTE ON DISTRICT ORGANISATION OF WORK (norwegian) (3p)
18	8412-12	PHASE III PROGRAMME AGREEMENT ZAMBIA/NORWAY (14p)
19	8501	PROGRESS REPORT (30p)
20	8501	ESTIMATES OF REVENUE/EXPENDITURES, GOVT. OF ZAMBIA 1985
21	8503	2. TRAVEL REPORT AA. RØNNINGEN (90p)
22	8504	PHASE IV PROGRAMME AGREEMENT ZAMBIA/NORWAY (16p)
23	8505	POLICY PAPER ZAM 007 (in norwegian) (15p)
24	8506	NAC NAT'L. PLAN OF ACTION ID WSS DECADE (ca 400p)
25	8506	3. TRAVEL REPORT AA. RØNNINGEN (50p)
26	8509-25	PLANNING NOTE HEALTH/SANITATION/COMM.PARTICIP. (20p)
27	8511	TECHNICAL EVALUATION (110p)
28	8512	4. TRAVEL REPORT AA. RØNNINGEN (90p)
29	8512	NAC REPORT TO IDWSS DECADE AFRICA REGIONAL EXTERNAL SUPPORT CONSULTATION, ABIJAN, NOVEMBER 1985 (21p)
30	8601	ZAMBIA COUNTRY STUDY AND NORWEGIAN AID REVIEW (200p)
31	8601	ECONOMIC REVIEW/ANNUAL PLAN 1986, GOVT. OF ZAMBIA
32	8602	5. TRAVEL REPORT AA. RØNNINGEN (120p)
33	8603	IMPLEMENTATION PLAN. SECOND EDITION (50p)
34	8603	SURVEY REPORT COMM.EDUCAT./PARTICIPATION (13p)
35	8603-03	POLICY NOTE ON COUNTRY STUDY (in norwegian) (3p)



36	8604	FOURTH NATL. DEVT. PLAN: SUMMARY (17p)
37	8604-03	POLICY NOTE ON AID TO ZAMBIA (in norwegian) (12p)
38	8604-04	PROVINCIAL MEDIUM TERM DEVELOPMENT PLAN WESTERN PROVINCE (130p)
39	8604-30	AGREED MINUTES COUNTRY NEGOTIATIONS LUSAKA (7p)
40	8605-16	POLICY PAPER ON AID TO ZAMBIA (in norwegian) (12p)
41	8606-17	AGREED MINUTES COUNTRY CONSULTATIONS LUSAKA (10p)
42	8607	DRAFT PAPER ON NATL. WATER/SANITAT. AUTHORITY (54p)
43	8609	6. TRAVEL REPORT AA. RØNNINGEN (120p)
44	8609	WHERE HIGH-TECH IS APPROPRIATE. S.SUTTON (1p)
45	8610	NORWEGIAN POLICY ON DEVELOPMENT ASSISTANCE APPLIED IN ZAMBIA. J. STORAAS, RES.REP. (10p)
46	8610	NORWEGIAN POSITION PAPER ON COOP. ACTIVITIES IN THE WATER SUPPLY AND SANITATION SECTOR, ZAMBIA (4p)
47	8610	WATER COLLECTION AND USE. CASE STUDIES IN A RURAL AREA. J. HARNMEIJER (14p)
48	8610-17	COSTS AND REVENUES OF DWA SCHEMES. H.REINI (75p)
49	8611	7. TRAVEL REPORT AA. RØNNINGEN (100p)
50	8612	HAND-DUG WELLS OR BOREHOLES FOR RURAL WATER SUPPLY IN WESTERN PROVINCE, SUTTON/HARNMEIJER/SUTTON (5p)
51	8612	ROTARY OR PERCUSSION? S.SUTTON (4p)
52	8612-05	TOWNSHIP WATER UTILIZATION. PRESTUDY ON THE REQUEST OF THE EVALUATION MISSION. J. HARNMEIJER (8p)

#### OTHER REPORTS REGARDING THE 8 TOWNSHIP SUPPLIES (INTERCONSULT):

- FEASIBILITY STUDIES,
- DESIGN REPORTS,
- LEAKAGE/WASTAGE DETECTION REPORTS



## ITENERARY

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Mon	1.12	Briefing NORAD Briefing DWA
Tue	2.12	Arrival Mongu Meeting PMO's office Meeting DWA. Rural Water Supply Section
Wed	3.12	Introductory meeting DWA Visit to drilling site. Limulunga road Meeting Provincial Planning Unit Individual discussions with DWA staff
Thu	4.12	Site meeting. Senanga Township supply Visit to Litoya and Itufa villages in Senanga district Meeting Permanent Secretary
Fri	5.12	Visit to Kalabo township supply Visit to Kaoma township supply Visit to Luatenso Village
Sat	6.12	Visit to low-cost houses, Namushakende Visit to rural water supplies Mongu area Visit Mongu townships
Mon	8.12	Meeting WASHE Steering Committee Meeting individuals DWA and MOH
Tue	9.12	Visit to township supply, drilling site and villages in Lukulu district
Wed	10.12	Arrival Lusaka Meeting Interconsult
Thu	11.12	Meeting Ministry of Health Meeting DWA, Chief Water Engineer
Fri	12.12	Meeting NCDP Meeting DWA, Director Meeting Ministry of Decentralisation Workshop on conclusions/recommendation



Sat 13.12 Report writing/discussion

Mon 15.12 Meeting NORAD  
Meeting Interconsult  
Meeting MAWD

Tue 16.12 Finalize conclusions/recommendations

Wed 17.12 Debriefing MAWD, DWA, MOD, MOH, NORAD, PS Western Province



## LIST OF INDIVIDUALS MET

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### LUSAKA

Mr. C. R. W. Kayombo, DWA, Director  
Mr. L. L. Mbumwae, DWA, Chief Water Engineer  
Mr. J. Storaas, NORAD, Resident Representative  
Mr. J. Eie, NORAD, Assistant Resident Representative  
Mr. M. Mwale, NCDP, Assistant Director

Mr. S. K. Mubukwanu, MOD, Permanent Secretary  
Mr. J. A. Zulu, MOD, Senior Economist  
Mr. C. Chisunka, MOD, Senior Provincial Local Govt. Officer  
Mr. H. M. M. Mwanakatambo, MOH, Dept. Chief Health Inspector  
Mr. V. Musowe, MOH, Health Planner

Mr. T. Damhaug, Interconsult AS, Resident Manager  
Mr. M. Soko, MAWD, Senior Economist  
Mr. A. K. Banda, MAWD, Senior Economist  
Ms. C. Z. Belemu, MAWD, Desk Officer  
Mr. T. Vigtel, NORAD, Deputy Resident Representative

Ms. B. Soccorsi, NORAD, Women's Programme Coordinator  
Mr. F. K. Mambwe, MOH, Chief Health Inspector  
Mr. Sinyangwe, MOH, Primary Health Care Organizer

### MONGU

Mr. L. Mbula, Permanent Secretary  
Dr. C. Musowe, Provincial Medical Officer  
Mr. F. Nyirenda, PMO, Acting Senior Health Inspector  
Dr. J. W. Harnmeijer, PMO, Primary Health Care Advisor  
Mr. M. S. Malipilo, PMO, Provincial Laboratory Technician

Mr. E. Svien, Provincial Water Engineer  
Mr. I. Mbewe, DWA, Water Engineer  
Mr. A. Phiri, DWA, Engineering Assistant  
Mr. A. Mpondela, DWA, Engineering Assistant  
Mr. J. Bestvold, DWA, Workshop Superintendent

Mr. E. Ngoma, DWA, Drilling Superintendent  
Mr. M. Songolo, DWA, Engineer

Mr. A. M. Likando, DWA, Water Engineer  
 Mr. S. M. Mundia, DWA, Training Instructor  
 Mr. A. T. Holter, DWA, Training Coordinator

Mr. H. Olsen, DWA, Building Superintendent  
 Mr. W. Nkonjela, DWA, Hydrologist  
 Mr. I. M. Mukulwamutiyo, DWA, Assistant Engineer  
 Mr. G. M. Mukubonda, DWA, Executive Officer  
 Mr. H. M. Matondo, DWA

Mr. J. S. Sutton, DWA, Ground Water Engineer  
 Ms. S. Sutton, DWA, Hydrologist  
 Dr. J. Harnmeijer, DWA, Community Participation Coordinator  
 Mr. S. Mahendranathan, Interconsult AS  
 Mr. S. Skarstoel, Interconsult AS

Mr. B. Matthew, LWF, Water Engineer  
 Mr. T. Kaulum, DWA, Senior Mechanical Supervisor  
 Mr. D. Noppen, MCC, Senior Regional Planning Officer  
 Mr. M. Liywalii, PMO, Senior Health Educ. Officer  
 Mr. R. Doyle, LWF, Coordinator

## **SENANGA**

Mr. Mushimba, District Officer  
 Mr. Banda, DWA, Officer in Charge

## **KALABO**

Mr. D. G. Namakando, District Governor  
 Mr. H. M. Matonto, DWA, Officer in Charge  
 Mr. V. N. Kasimona, DWA, Water Engineer  
 Mr. Wina, DWA, Operator in Charge

## **KAOMA**

Mr. E. M. Shikampa, District Health Inspector

## **LUKULU**

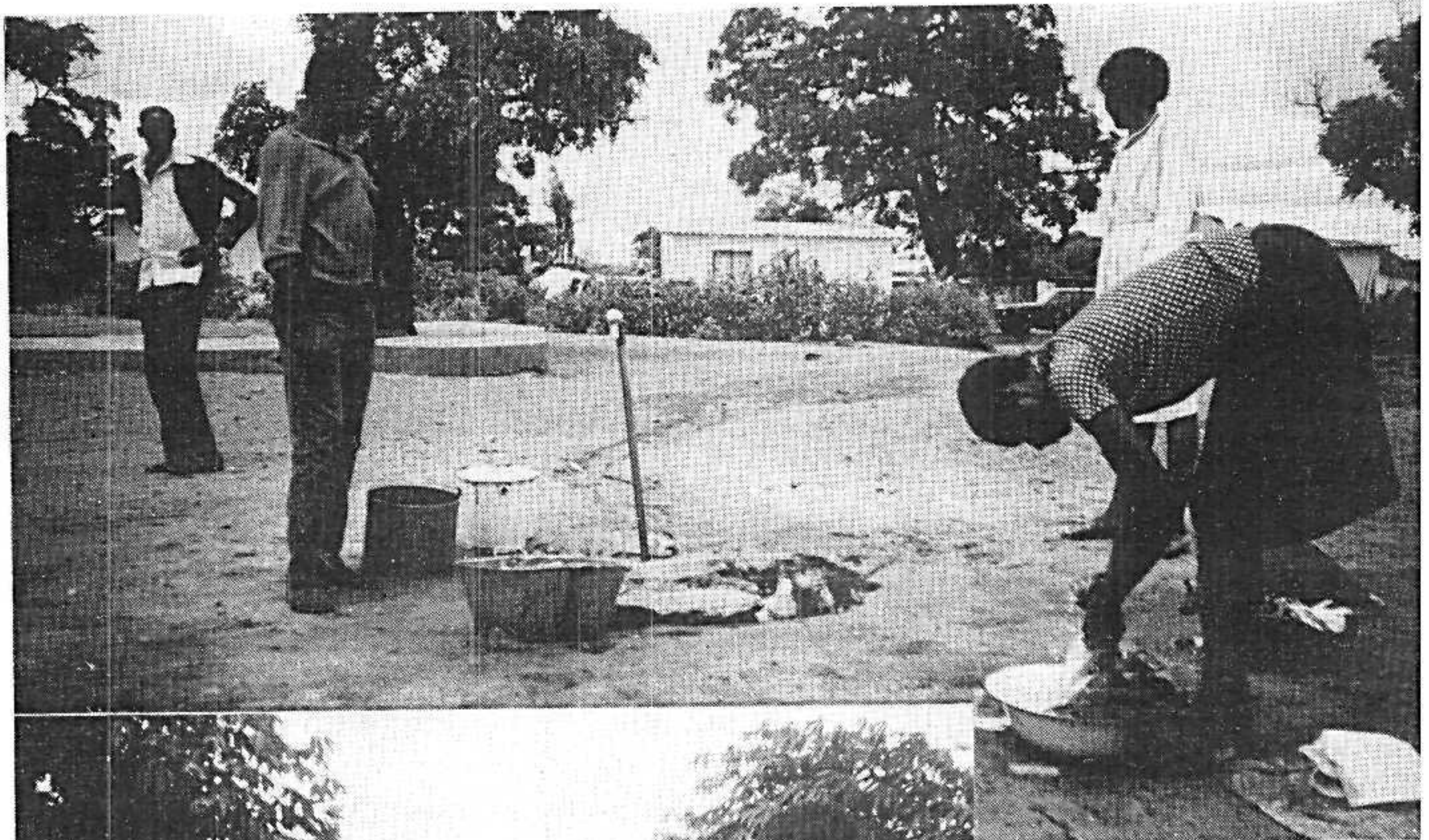
Mr. Nwitumwa, DWA, Officer in Charge





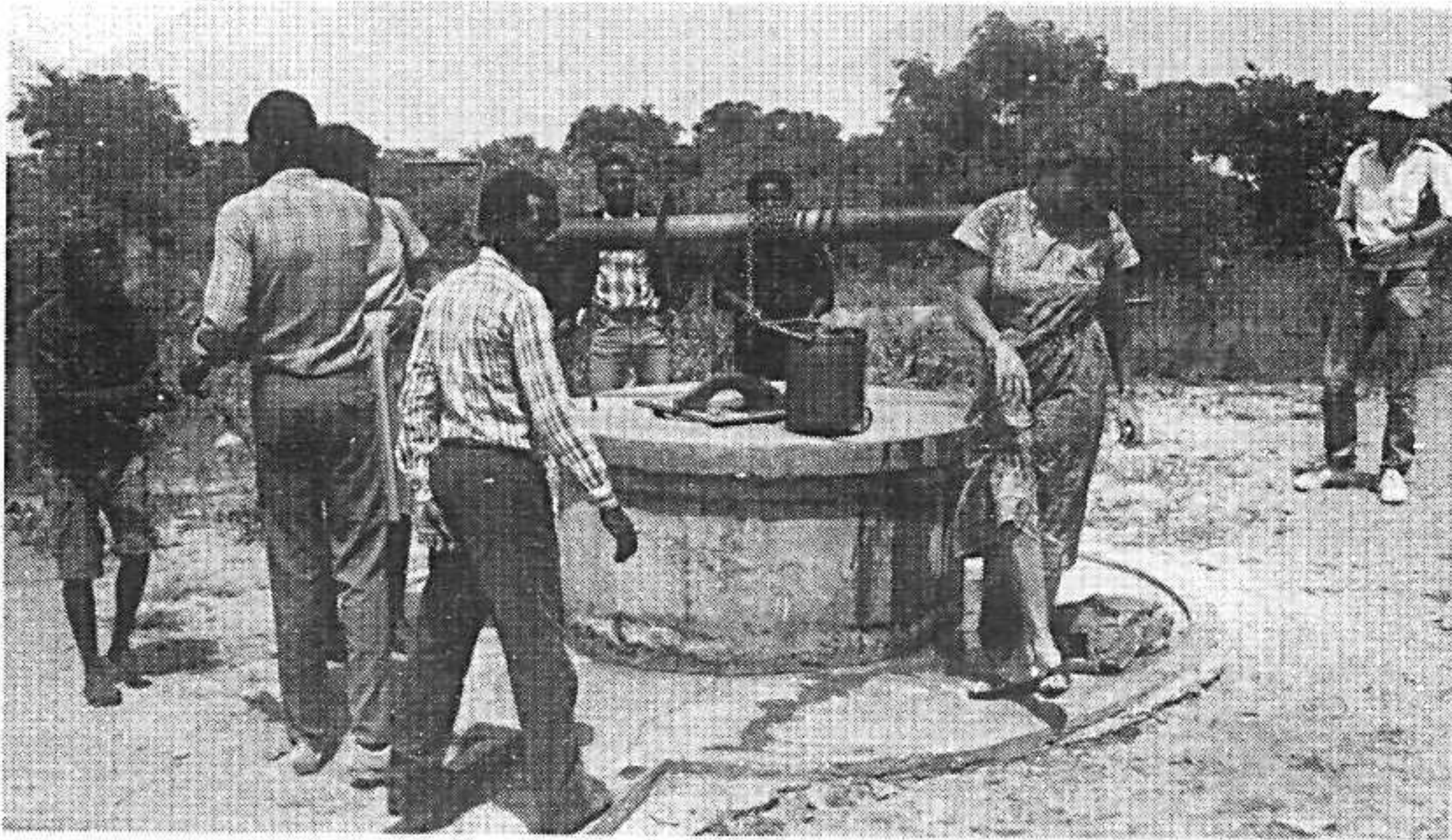
Details from the township water supply in Kalabo





Details from communal standposts, Mongu township water supply scheme. The pipes are very vulnerable since there are no headworks, and the surroundings are unhygienic since there are no run-offs or soak-aways.



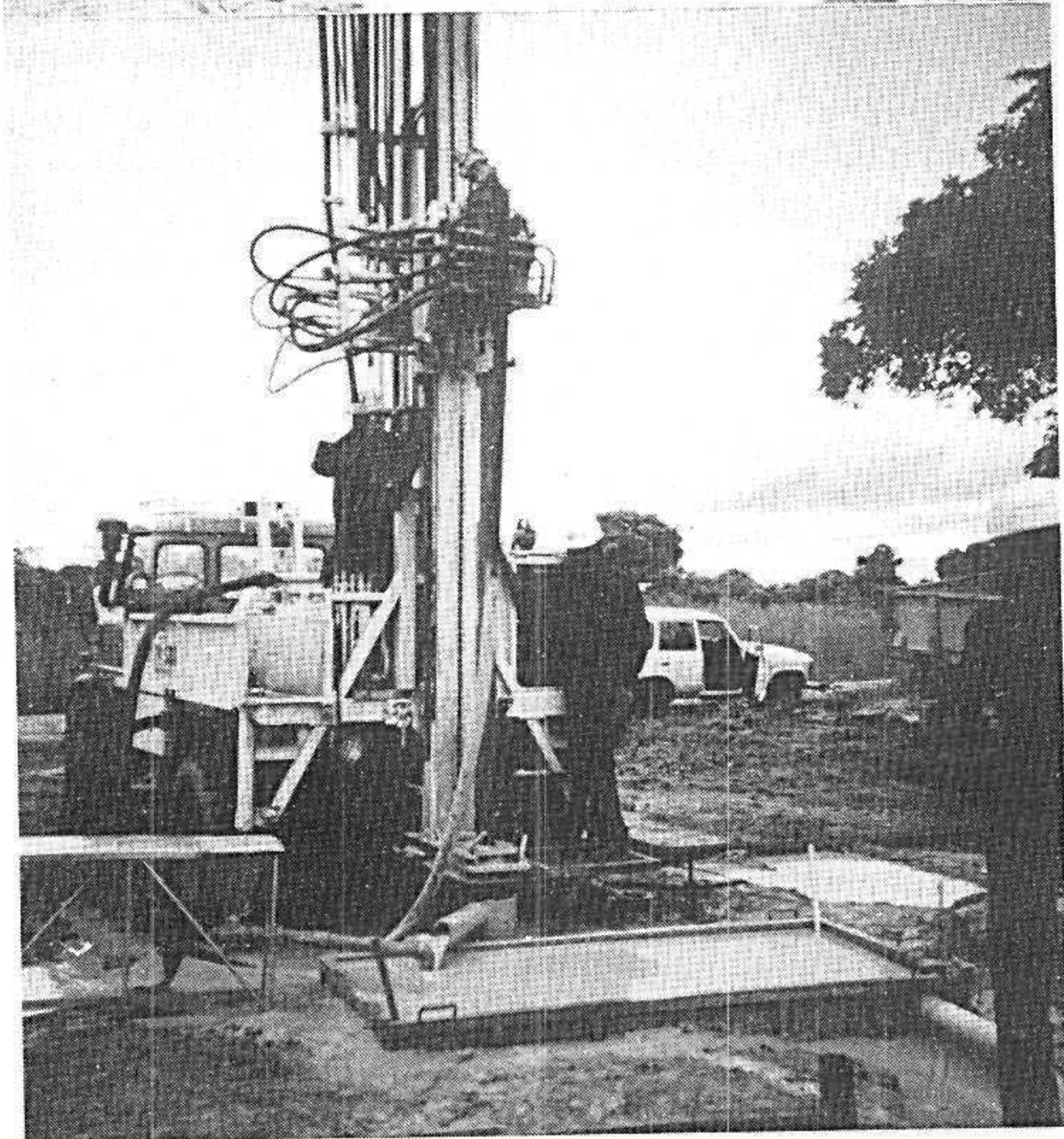
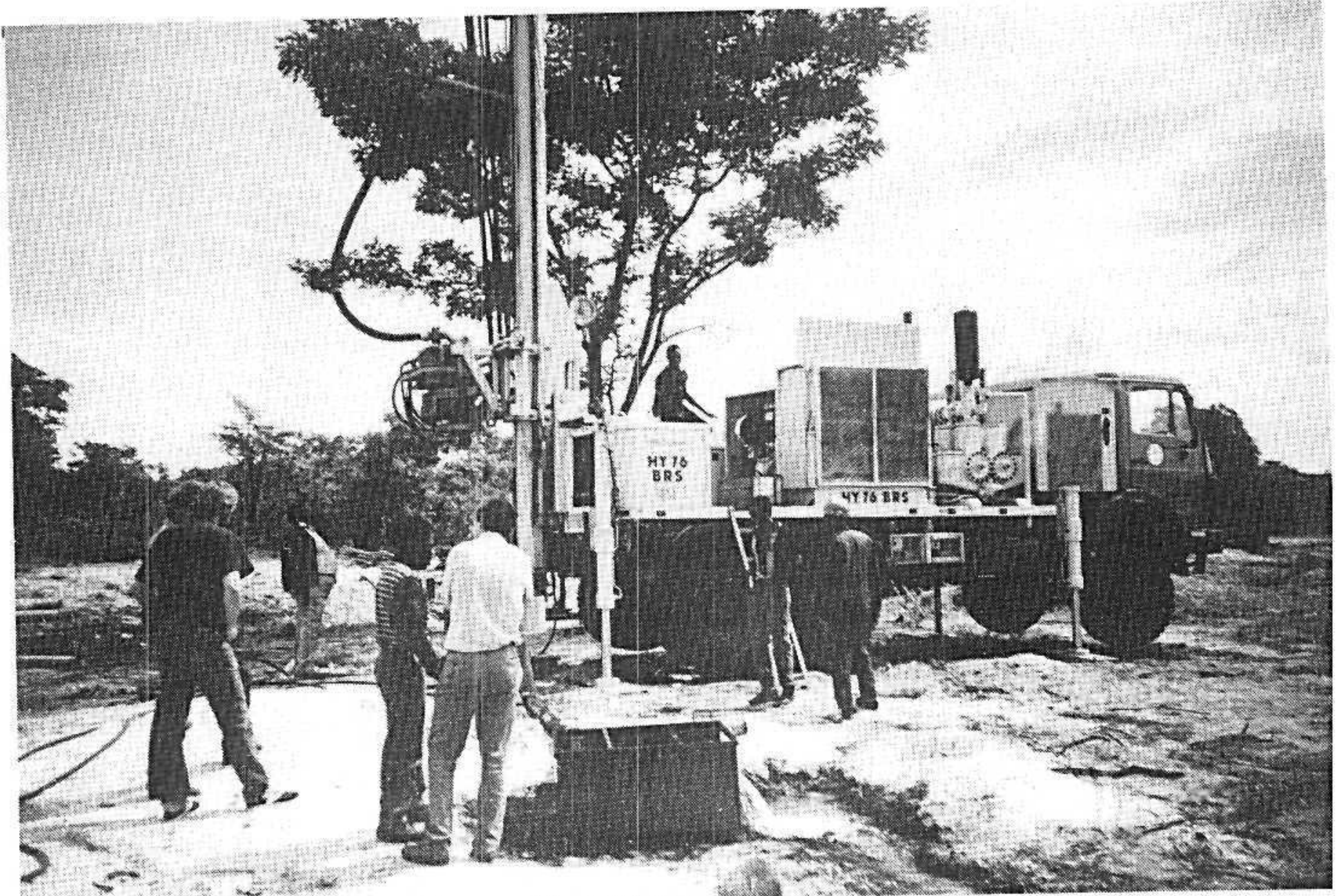


Improved rural water supplies constructed by the Programme.

Top: Shallow well with concrete lining, windlass and steel bucket.

Left: Blair-pump with reinforced run-off and fencing.





The drilling rigs presently used on the programme.

Top: The largest rig.

Left: The smaller rig. The compressor for the rig is mounted on a lorry to the right, outside the picture.











