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ZAM 007 WATER SUPPLY AND SANITATION PROGRAMME

WESTERN PROVINCE, ZAMBIA



A PROJECT REVIEW

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Lusaka- November 1992

FOR



NORAD

DIREKTORATET FOR
UTVIKLINGSHJELP
NORWEGIAN AGENCY FOR
DEVELOPMENT COOPERATION

GOVERNMENT OF THE
REPUBLIC OF ZAMBIA
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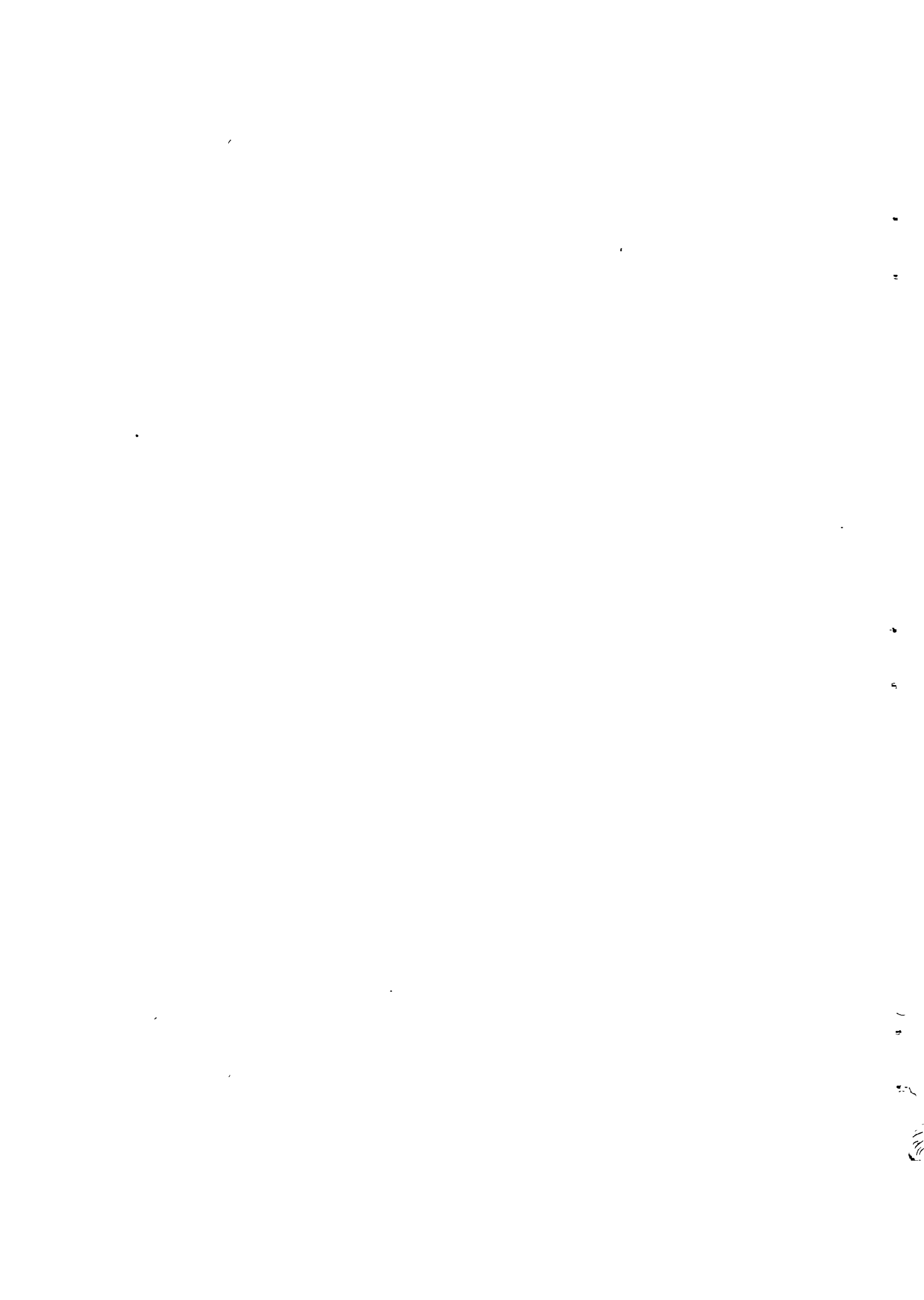


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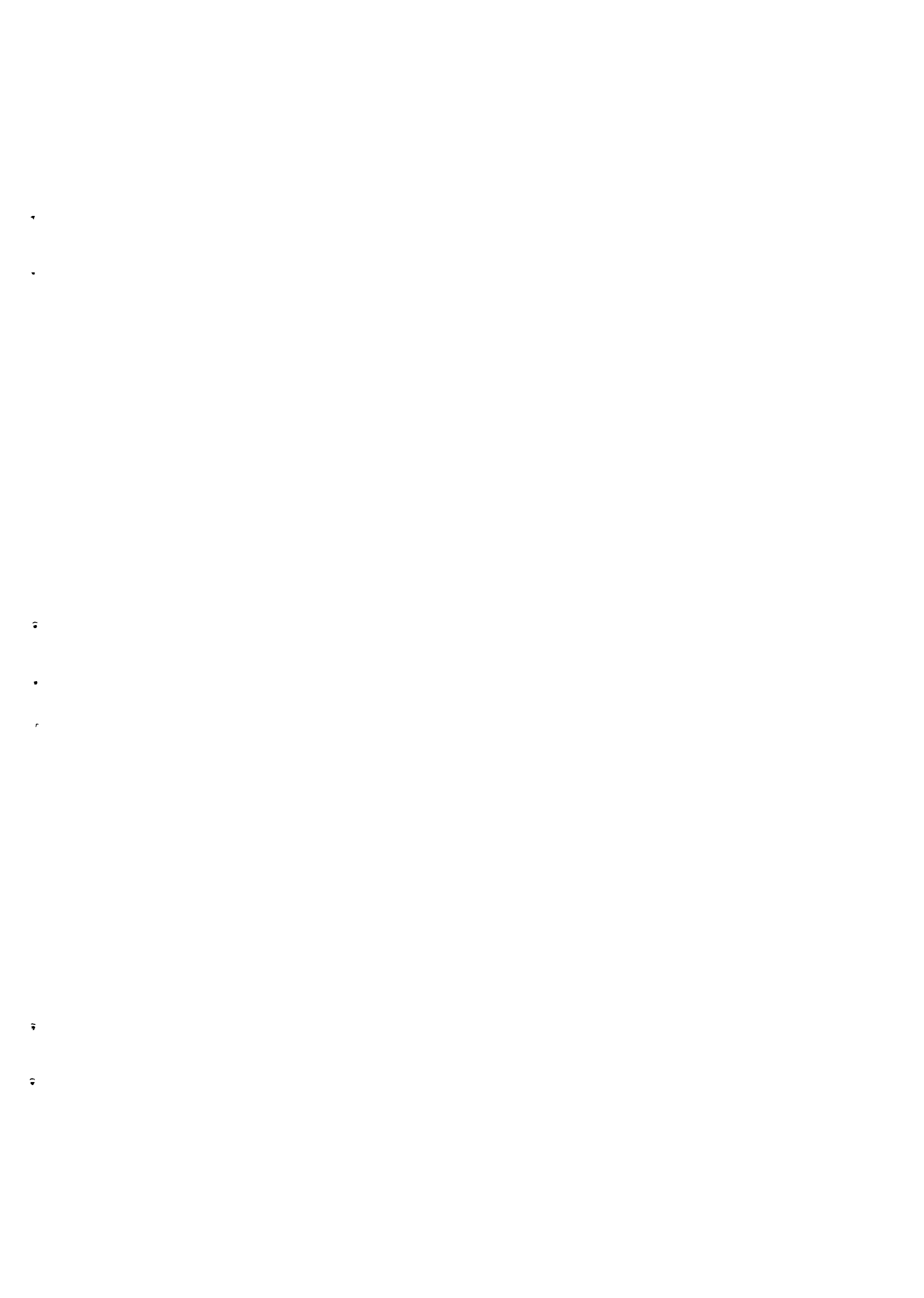
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ABBREVIATIONS

AIDS	Acquired Immune Deficiency Syndrome
CEP	Community Education and Participation
DHI	District Health Inspector
DWA	Department of Water Affairs
D-WASHE	District WASHE Committee
DWE	District Water Engineer
EEC	European Economic Community
GNP	Gross National Product
GRZ	Government of the Republic of Zambia
HA	Health Assistant
MDC	Mongu District Council
MOH	Ministry of Health
MWW	Mongu Water Works
NGO	Non-Governmental Organisation
NOK	Norwegian Kroner
NORAD	Norwegian Agency for Development Cooperation
O & M	Operation and Maintenance
ORT	Oral Rehydration Therapy
PHC	Primary Health care
PHI	Provincial Health educator
PMO	Provincial Medical Officer
PPU	Provincial Planning Unit
P-WASHE	Provincial WASHE Committee
PWE	Provincial Water Engineer
UNICEF	United Nations Children Fund
VIP	Ventilated Improved Pit
VWC	Village Water Committee
VMT	Village Maintenance Team
WASHE	Water, Sanitation, and Health Education
WE	Water Engineer
WHO	World Health Organization
ZAK	Zambian Kwacha
ZESCO	Zambian Electricity Supply Corporation

INTRODUCTION

The Water and Sanitation Programme in Western Province has a long history and has been the object of several studies and evaluation reports. However, NORAD Lusaka felt that these reports have been somewhat piecemeal as well as not documenting the changes that have actually taken place in the programme during the last number of years. Few comprehensive independent assessments and evaluations have been made, which covers the whole spectrum of activities in the Programme and seeing those in the context of Zambia's plans and priorities within the sector. The Project Review was therefore commissioned by NORAD with this as the main objective. The full Terms of Reference, prepared in cooperation with Zambian authorities is included as Annex 1 of the report..

The study team comprised the following persons:

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The study was carried out in the period 11th October to 1st November 1992. The itinerary of the study is included as Annex 3 of the report.

Please note that the report has been prepared by the team and that the views expressed in this report are those of the authors and do not necessarily reflect those of NORAD or the Government of Zambia.

We in the team express our gratitude to all parties in Zambia and in particular in the Western Province who provided us with the assistance and information that made this report possible.

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Lusaka, 2 November 1992

EXECUTIVE SUMMARY

Project ZAM 007 has over a 15 year period developed into a sectoral programme for Western Province, through the provision of improved traditional wells and handpumps to scattered rural settlements, piped water supplies to seven townships and a municipal water supply scheme to the Provincial capital.

The first stage (1977-1985), focussed on the construction of water supply services. The second stage (1985-1989), addressed community participation, hygiene education and sanitation, and capacity building for operation and maintenance. The third stage (1989-present) has focussed on consolidating investments made, institutionalising O & M capacity, and preparing an agenda for phasing out.

The Township Water Supply programme can be divided into: the 6 District Township Supplies, the Mongu & Limulunga Township Supplies, the Sanitation I, and Sanitation II pilot projects. The objective of the programme is to rehabilitate the township water supply systems and where necessary increase the capacity of the distribution network, and to build up the operation and maintenance capacity of the responsible authorities, and work towards full cost recovery of operational costs. Sanitation I aims to improve sanitary conditions around communal stand-pipes in townships through a community participation approach. Sanitation II aims to pilot a community-based latrine and hygiene education project in the peri-urban areas of Mongu township.

The Rural Water Supply Programme can be divided into three components: Rural Wellpoints, Microprojects and Secondary Settlements. The programme objective is to increase access to reliable and clean water supplies for rural dwellers, achieve sustainability, and improve hygiene practices relating to water and sanitation.

The Township Water Supplies

Mongu and Limulunga Townships

Design and Present Status

Conclusions

Mongu District Council is so far the only Council in the province which has taken over responsibility for running their township water supplies.

Mongu township water supply was augmented in 1983 to serve 45000 people. It was again upgraded in 1987 to serve an estimated 1995 population of 96000.

Both townships have operational systems. However, Limulunga has insufficient water due to corroded rising mains in several boreholes. Mongu has water shortages in some areas mainly due to leakages.

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Recommendations

NORAD should not provide funds for any further extension of the reticulation to unserved areas, unless it is also prepared to fund a new expansion of the water supply.

However, NORAD should fund the remaining work to meet the designed capacity for Mongu.

Organisation and Institutional Matters

Conclusions

Mongu Water Works is now a semi-autonomous body with its own management and its own account. However, at present it must be regarded as **not** yet sustainable.

In the future, it will be able to manage and maintain the water supply systems provided it is given the opportunity to operate on a commercial basis.

Efforts are being made to increase revenue. The introduction of water meters, improvements to the distribution network at the Hilltop, and revised tariffs will result in recovery rising from a present 50 % to 60 % in 1993.

Whereas DWA has committed itself to absorb the township's salary costs for the next two years, Mongu District Council shoulders full responsibility on the water works to meet its recurrent costs.

Recommendations

To fully establish Council ownership of the water supply systems, and to reduce NORAD's support for O&M, a phasing out period of three years is suggested. It is recommended that the support from outside starts in 1993 with a cost sharing of 75/25 % from NORAD and Mongu District Council respectively, and ends with a 25/75 % share of costs in 1995.

Mongu Water Works should implement the following to curb water loss and increase revenue income:

1. Water meters should be installed at every GRZ, Council and commercial institution.
2. The old distribution system at the Hilltop should be redesigned and rehabilitated.
3. Total separation of pressure zones should be implemented.
4. Close monitoring of water consumption in different areas before and after the different actions are introduced, should be undertaken.
5. An action plan detailing the implementation of these activities should be prepared.

The DWA Townships

Design and Present Status

Conclusions

All the six townships have operational reticulated water supplies. However, Kaoma and Lukulu have occasional water shortages due to insufficient electricity supply (thermal power).

The present flat rate water tariffs do not accurately reflect the different consumption patterns between the consumer groups. Commercial, Institutional and High/Medium cost house consumers, have up to recently only paid for a fraction of the water consumed.

Recommendations

NORAD should not fund projects to extend the service area within the townships. Such expansion work should become the responsibility of DWA, and should be financed on a commercial basis.

Organisational and Institutional Matters

Conclusions

GRZ has taken several important initiatives to address their policy of achieving full cost recovery on operation and maintenance. This includes, introduction of water meters, 6 monthly increase in tariffs, improvement in revenue collection efficiency, and a commitment to allow the Province to retain collected revenue as a revolving fund, to begin in 1993.

DWA is confident that revenues can be increased progressively to a point where full cost recovery can be met by 1995/1996.

It will be necessary to review stand-pipe users' ability and willingness to pay. It may well be that full cost recovery cannot be obtained from these consumers.

The problem for the Water Departments is that replacement of worn out machinery requires FOREX and sufficient income to pay for the expenses related to the investment. It is not foreseen that the townships will be able to retain enough revenue to cater for major overhaul before 1995-96.

Improved services to institutions and high cost housing areas can be profitable, but expanded services to areas where the ability to pay is limited will result in the need for cross-subsidisation.

Communal stand-pipe users are expected to maintain their facilities and to pay for water consumed. Support from DWA to these user committees is modest, but has improved through the Sanitation I pilot project.

Recommendations

NORAD should continue to provide funds to support the replacement of parts which require FOREX, at least until 1995/6. Such support can be phased out as DWA approaches full cost recovery and GRZ is able to secure FOREX.

Social Impact

Conclusions

The Sanitation I pilot project has with relatively little money managed to introduce a better understanding of what communal ownership implies, better understanding of the benefit of clean and easily accessible water and the consequences of misuse. The exercise, in addition, has contributed to curb water loss.

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Recommendations

NORAD should fund the continuation of the Sanitation I project so that it can be replicated to all townships in the province.

The CEP input to the townships should be reinforced to ensure hygienic collection and use of stand-pipe water.

Technology

Conclusions

In low-income peri-urban areas, where the option of providing stand-pipe water may prove to be too costly both to GRZ and to the consumer, alternative ways of providing water supply by means of boreholes and handpumps should be considered.

Recommendations

NORAD should fund and encourage a pilot project of this kind with the aim of determining the feasibility of alternatives to supply from communal standposts.

Rural Water Supplies

Design and Present Status

Conclusions

The Rural Water Supply Programme has recorded significant achievements in terms of developing a sustainable rural water supply system.

By comparison, the initial programme, implemented until 1985 must be viewed as an almost complete failure.

By the end of phase V (1993), the target of constructing 1062 operational wellpoints will probably be achieved, serving an estimated 43 % of the rural population.

The Microproject offers a cheap and sustainable option for upgrading water supplies where water is close to the surface. A further 25 % of the rural population can be served by this project.

Poor record keeping in the past, and the virtual absence of any formal monitoring system has made the task of determining actual coverage and outstanding needs especially difficult.

Community-based management of facilities through the Village Maintenance teams can be attained and improvements in hygienic practices should follow. The potential benefits of the programme could have been enhanced if a sanitation component had been developed.

The present level of activity in the rural programme is too high to be sustainable without external support. However, the peak level of implementation has passed and the programme will progressively focus on the maintenance and rehabilitation of installed supplies.

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Recommendations

NORAD should fund the construction of additional boreholes and handpumps based upon an appraisal of outstanding workload, and rig capacity.

A project activity plan should be prepared by the province to take account of outstanding workload. This can only be developed once a comprehensive inventory of present coverage has been produced.

NORAD and DWA are urged to identify ways of reducing the FOREX component of the programme, in anticipation of the future handover of the programme to GRZ.

The use of the heavy drilling rig (HY 76) should be phased out over the next 2-3 years. The lighter drilling rig (HY 79) will still be needed, which NORAD should continue to support. However, jetting of tube-wells in the alluviums on the plain, should be used as a first option.

NORAD should continue to fund the upgrading of traditional wells (micro project). The CEP teams should be more involved in training local builders in the skills of improving the traditional wells.

Institutional And Organisational Issues

Conclusions

To achieve sustainability, a high input of software is required. Without the CEP component, there is little chance that technical input alone can yield sustainable results, as the early years of the programme proved.

A concept of integrated water supply, sanitation and health education, has been translated into a workable and operational system.

Other projects have come to study the experience of Western Province while members of the programme's CEP teams have been invited to address seminars and workshops in other parts of the country.

The CEP teams are not recognised within the GRZ establishment - in this respect, the CEP teams retain a project status.

The rural water sector has no counterpart staff at the national level. The set-up developed is project orientated, and to a degree autonomous from the overall structure of DWA. This raises several questions concerning the long term sustainability of a rural water supply programme.

Whilst community management of handpumps can be achieved, there is little chance that the costs of installation, rehabilitation, and of institutional maintenance and educational support can be recovered. An element of subsidy is inevitable.

There are almost 90 posts held by trained artisans which for the time being are not established. Their salaries continue to be drawn from the project. Without many of these posts, the programme is not implementable.

Recommendations

The Province should prepare an agenda for scaling down staffing requirements to match future operational levels.

NORAD support of operation and maintenance costs should be phased out over a four year period.

NORAD should provide FOREX to facilitate the purchase of spare parts until local manufacturers and suppliers have been identified.

GRZ must develop a national policy for rural water supply.

NORAD should provide funds to support the various software activities carried out by the CEP. GRZ must commit itself to continuing support of the CEP concept and by absorbing those Team members, presently paid for by the project, into the GRZ establishment.

Social Impact

Conclusions

The effectiveness of community management of rural water supplies is a function of the training and educational input provided by the CEP teams.

The CEP teams are the focal point of hygiene education. However, this aspect has been constrained by the absence of a latrine construction component.

Over 50% of the CEP teams consist of women. Some have been trained and employed in technical jobs such as plumbing, bricklaying, and metal work.

The Village Water Committee (VWC) membership consists of at least 50% women. Exposure and experience gained, has assisted women to develop skills and self confidence to negotiate their water needs openly.

The present CEP Teams' capacity is however limited. They cannot cope with the community expectations that the programme has created. The district-based CEP teams are relatively weak, and continue to rely on the provincial Team for support.

Recommendations

More systematic monitoring and evaluation studies are needed, covering such areas as health impact, women's participation, knowledge, attitudes and practices, and affordability.

The CEP methodology should be fully incorporated into the Microproject.

A training of trainers approach should be used to enhance the capacity of the district-based CEP teams.

NORAD should fund these suggested 'software' activities.

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Technology

Conclusions

So long as handpumps used in the programme are imported, the Province remains and will continue to remain dependent on foreign currency.

Spare parts for handpumps are not easily available to rural communities.

Recommendations

As communities get more confidence in diagnosing and repairing the handpumps, spares should be made available in the local shops. A pilot project on how to establish a credit scheme and a revolving fund for supply of spares should be investigated.

Sanitation

Conclusions

A draft feasibility study into upgrading of sewerage and sanitation installations in Mongu was carried out in 1979. To date no action has been taken. More generally, the sanitation sector has hardly figured in the 15 year history of the programme.

Remedial action regarding sewerage installations are long over due.

The pilot Sanitation II project, has paid insufficient attention to social, cultural and economic factors which will govern the success of the programme.

Techniques and materials developed by the CEP teams could be usefully applied to this project, and advantage could be gained by linking the project to the Sanitation I pilot project.

Considerable research and development is required before a sustainable latrine can be said to have been found. There are fundamental flaws with the present design, which are both technical and economic in nature.

Recommendations

The WASHE committees should ensure that the Ministry of Works and Supply is brought into a committee structure so that a plan of action can be made to attend to all outstanding remedial sewerage work.

The coordinators of the pilot sanitation project should commission a baseline knowledge, attitudes and practice study, to provide baseline data and assist in the formulation of an effective strategy.

A pilot rural sanitation project should be incorporated into the rural water supply programme, in order to assess the feasibility of promoting rural sanitation. NORAD should fund the pilot project.

Examples of low cost rural sanitation programmes in other parts of the continent should be reviewed. Recent developments in low cost technology in Malawi, and Tanzania could serve as appropriate models.

The pilot programme should also address on-site sanitation requirements within the townships.

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NORAD should not provide further support to this pilot project until a more comprehensive and properly planned low cost sanitation pilot project for the whole province is formulated.

The Water Sector

Conclusions

If and when the responsibility for the water supplies are handed over, the risk is that the small number of professionals engaged in the water sector in the provinces will be spread even more thinly in the districts.

Rural and peri-urban water supplies may receive insufficient attention from GRZ and the councils in a decentralised set-up.

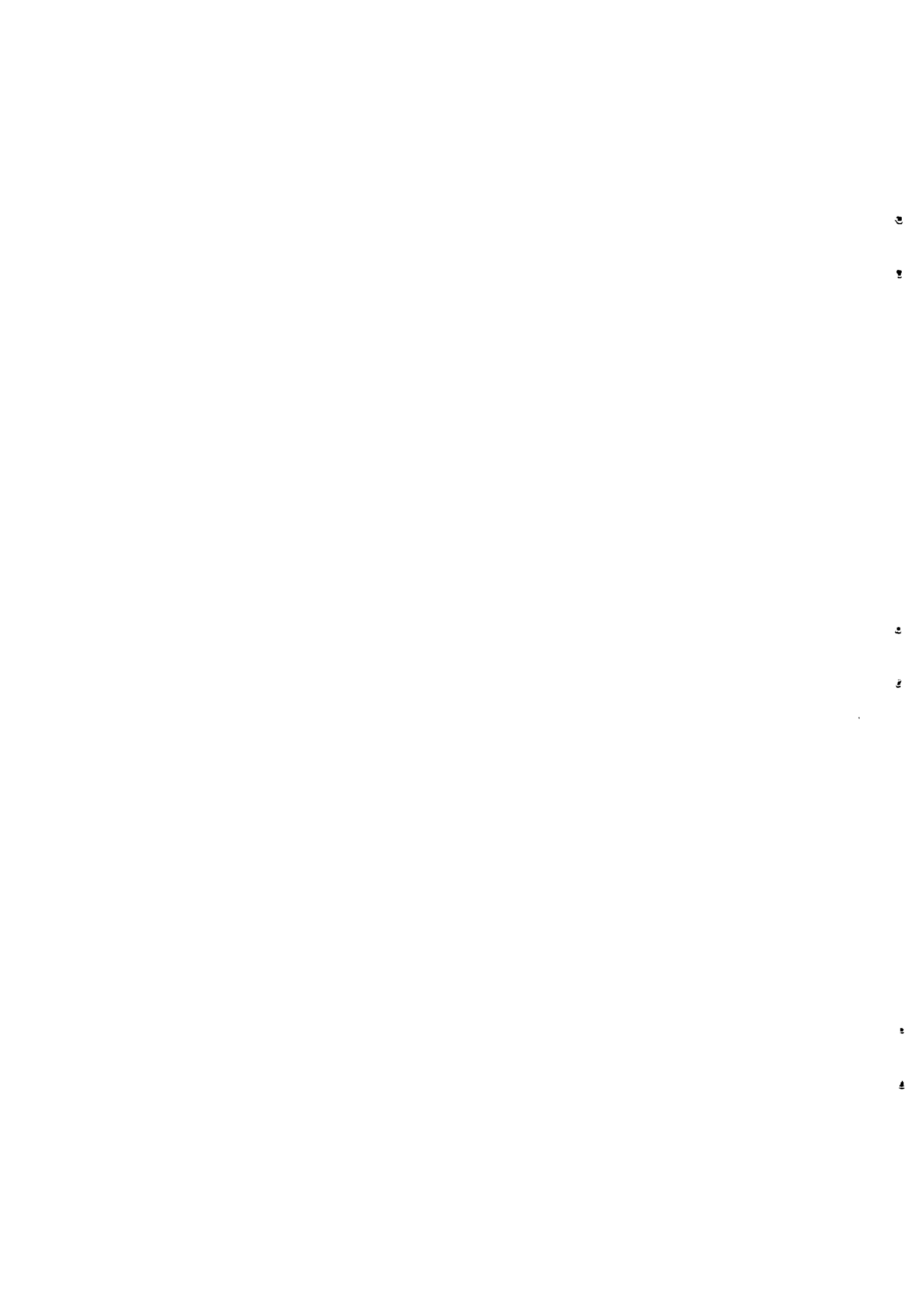
In the future, it is foreseen that the WASHE committees will have more of a coordinating role for the water supply and sanitation sector, in general.

Recommendations

There is a need for national coordination to deal with policy issues related to inter-ministerial cooperation at different levels.

NORAD should see the rural and peri-urban population as the main target groups for water supply and sanitation in the sector programme.

In the event of further support to rural water supply and sanitation activities, in other parts of the country, it is recommended that a post be established, at national level, to coordinate the rural sector. Such a post could be initially sponsored by NORAD.



Chapter 1

PURPOSE OF THE STUDY AND APPROACH

In the broadest sense the review team has aimed at providing an overall review of the NORAD supported Water Supply and Sanitation Programme in Western Province which has been running through consecutive phases since 1977. The Team has within the available time frame tried to identify and appraise positive and negative characteristics of this programme, which has evolved over a fifteen year period, and which consists of several discrete project components. Conclusions reached will be used to make recommendations for future NORAD assistance to the water sector, in Zambia.

Although there has been a wealth of documentation produced on behalf of the programme, few independent assessments have been made. Further, the Team has not been able to disclose a formal framework for monitoring and evaluation of the programme activities. The programme is, as a consequence, notable for a lack of systematic appraisal. As pointed out in the 1987 evaluation report (NORAD, 1987), this is probably due to the fact that the programme was conceived without the preparation of a proper project document, nor for that matter, the collection of baseline information. In addition, the different reports have a surprising lack of precise overview of achievements and constraints compared with planned interventions. Also surprising is the absence of any routine progress reporting between the province and both the Department of Water Affairs, and even the donor, NORAD, with the exception of their annual review meeting.

This evaluation has not re-trodden the ground covered by previous studies. Where possible, information obtained from available documentation has been used as the basis for further investigation based on discussions with all parties at central, provincial, district and community levels, and on considerable field visits to project areas. Given the short time available to the Team, it was not possible to conduct an in-depth user survey which could have yielded important qualitative and quantitative data. However, the opportunity was taken to conduct in-depth discussions with a selection of communities which have participated in the programme. Where necessary, the report, makes reference to previous studies, where useful information pertaining to specific components of the programme can be obtained. This is particularly important to get a picture of the earlier years of the programme.

A copy of the Terms of Reference and details of the Team's stay in Zambia, including persons met and places visited can be found in annex 1 - 3. Summarised here are the overall objectives of the study as presented in the Terms of Reference:

- * Assess the overall progress of the project in relation to the stated objectives, and the appropriateness of these objectives in relation to Zambia's plans and priorities within the sector.
- * Present and assess the achievements of the Programme to date, and the sustainability of the different components.
- * Make recommendations on the future development of the water sector in Western Province. This should include concrete and practical recommendations on changes or essential additions which the Team feels are relevant to ensure the long term sustainability of the sector in Western Province.
- * Present the main conclusions and "lessons learned" which could be useful in the possible preparation of a new NORAD financed Water Sector Programme in Zambia.



Chapter 2

PROJECT DESCRIPTION

2.1. Introduction.

Project ZAM 007 has over a 15 year period developed into a sectoral programme for Western Province. The programme has attended to the overall water supply requirements of the province's 6 districts, through the provision of improved traditional wells and handpumps to scattered rural settlements, piped water supplies to seven townships and a municipal water supply scheme to the Provincial capital. Between 1977 and 1985, the programme focussed primarily on building up physical infrastructure through separate rural water supply and township water supply projects. Since 1985, construction work has continued but has been accompanied by increasing support to institutional capacity building. This has focussed on operation, maintenance and financial sustainability, through funding of new offices and workshops, equipment and spare parts, short and longer term technical support to set up procedures, train counterparts, as well as to attend to particular problem areas, and of in-country and external training programmes for technicians and professionals. Sanitation and health education have latched on as intended components of the programme, today enjoying somewhat greater recognition than was the case earlier on.

NORAD funding to the programme has been allocated through five successive phases:

	NOK (Million)
Phase I (1977-79)	17.2
Phase II (1980-83)	85.0
Phase III (1984-85)	45.0
Phase IV (1985-89)	100.0
Phase V (1990-93)	37.0
<u>Misc. Allocations</u>	<u>19.8</u>
TOTAL	304.0

In an historical perspective, the programme has evolved through three main stages, which have straddled the five operational phases of the programme. The first stage ran between 1977 and 1985. It was characterised by an engineering approach which focussed on the construction of water supply services. The second stage ran between 1985 and 1989, and reflected the recommendations of a critical report in 1984 and an even more critical evaluation report commissioned by NORAD towards the end of 1986. It was a period characterised by a recognition of the need for a software component to support the programme which would address community participation, hygiene education and sanitation, and which would address capacity building for operation and maintenance. Construction activities also continued. The third stage is on-going having begun in 1989 and coincides with phase V. It is characterised by attempts to consolidate investments made, by scaling down new construction, institutionalising operation and maintenance capacity, and preparing an agenda for phasing out.

In view of the diverse activities covered under the ZAM 007 programme, a summary profile of its major components is presented. This profile is deliberately descriptive, preparing the ground for the analytical sections which follow.



2.2. Project Description

2.2.1. Rural Water Supply

Described below are the various components of the Rural Water Supply Programme, as it exists today. It is noted that the programme began as far back as 1977, and underwent a thorough re-organisation in 1985. The programme can be divided into three components:

- * Rural Wellpoints
- * Microprojects
- * Secondary Settlements

2.2.1.1. Rural Wellpoints

Objective:

To increase access to reliable and clean water supplies for rural dwellers residing in eligible communities, which are estimated to represent 50 % of the total rural population. Eligibility is based on a range of socio-economic, hydrogeological and environmental considerations. Present coverage has reached about 41 %.

To achieve sustainability in the operation and maintenance of water supplies by the community.

To achieve improved hygiene practices relating to water and sanitation.

Technology:

Drilling of shallow and deep boreholes by means of rotary and percussion drilling rig or by jetting (depth variable 5m - 50m +)

Deep wells are equipped with India MK II handpumps and shallow wells with Blair pumps. A variety of other pumps have been installed in earlier phases of the programme.

Prior to 1985 shallow wells equipped with buckets and windlasses were installed but few remain operational.

Delivery:

Village Selection: Information about the programme is disseminated through the Community Education and Participation (CEP) Team and community-based extension workers. Interested communities are required to submit a request which is received by a district programme planning committee, the D-WASHE committee. Requests are forwarded from all districts to the provincial programme planning committee, the P-WASHE committee which presents a priority listing to the Department of Water Affairs. The CEP teams then conduct an appraisal of each community to determine eligibility for participation. (A copy of the form is contained in annex 6) Based upon the results of their evaluations, the programme coordinator prepares a strategic implementation plan for siting, drilling and equipping boreholes. Communities not selected are re-considered for the complementary Microproject (see below).



Implementation: The C.E.P. Team begins work to mobilise the selected community. Attention focuses on the responsibility of the community to operate and maintain the handpump and on the role of the programme in addressing water and environmental health concerns. A Village Water Committee and a Village Maintenance Team (VMT) is selected. At this point, the drilling Team is instructed to drill the borehole. The community may be required to prepare an access road if necessary. Once completed, the CEP Team plumber and bricklayer install the handpump with the community. This involves the VMT disassembling and reassembling the handpump. Official handover takes place after a 6 month grace period.

Operation and Maintenance: The community is now responsible for operation and preventive maintenance of the pump, for procuring small spare parts and undertaking minor repairs. When the community is unable to attend to a breakdown, the DWA mobile Team may be called out. A fee is charged. Major repairs and replacements are carried out by DWA, and present practice is for DWA to meet a portion of the cost. The CEP provide follow-up services to train the VMTs, assist in sorting out any organisational problems and discuss further hygiene matters. Focus group discussions, flip-charts, song and theatre and other interactive techniques are used. In addition, schools are earmarked for additional health education activities. Monitoring of hygiene behaviour and health indicators has been introduced in selected communities and schools, but has not yet been analysed and presented on a systematic basis.

Costs: It is estimated that the cost of drilling a borehole and installing a handpump averages NOK 80,000.00. Presently, this full cost is paid for by the Department of Water Affairs. NORAD's contribution to this capital cost amounts to 90 % of the total cost. The community normally provide local sand and stone. Operation and maintenance costs are borne by the community through the purchase of spares and the payment of call-out charges, and by the DWA through support provided by the CEP teams. Estimated at an average NOK 1,000.00 per annum, the community contributes to approximately 20 % of this cost. NORAD supports 95 % of the balance. Thus, for the time being, the programme is highly subsidised.

2.2.1.2. Microprojects:

Objective:

To assist small rural communities not eligible for the handpump programme to improve traditional water sources. Such settlements are estimated to account for up to 25 % of the rural population and tend to be located along the plain margin of the Zambezi river. Each facility should serve up to 50 persons. To date, between 150 and 200 improved wells have been built. The programme began in 1988.

Technology:

Construction of collars and cover slabs to hand-dug and shallow wells, using concrete and timber.

Delivery:

Overall responsibility for the project is shared between DWA and the provincial Primary Health Care (PHC) programme of the Ministry of Health (MOH), on a district by district basis. Actual supervision is conducted by Health Assistants attached to the various rural health centres. Under the DWA programme, communities not selected for the handpump programme are referred to the local health assistant for consideration. Under the PHC programme, selection is based upon community



diagnosis of problem areas. The issue of safe water and of water hygiene is discussed between the Health Assistant and the community. Proposals are made on how best to improve the traditional source and a water committee is selected. Where possible, the teaching aids utilised by the CEP teams are drawn on, but this has not occurred on a systematic basis. Either DWA or MOH has financed the purchase of materials, whilst construction is carried out by the Health Assistant. The community assists through the provision of locally available building materials. Periodically, water samples are taken from the improved source in order to test for bacteriological contamination.

Operation and Maintenance:

The little maintenance that is required is carried out by the community under the direction of its water committee. The committee can call on the Health Assistant to sort out problems that might arise, and in instances, the CEP teams also lend support.

Cost:

Material costs vary depending on the depth and diameter of the water source, and depending on the particular improvement selected. Cement, and perhaps timber are the only materials which need to be purchased. No more than 3-4 pockets of cement should be required. The material cost is therefore in the order of NOK 40.00. NORAD presently funds material procurement for the programme falling under DWA. Labour is provided by the Health Assistant, employed by the MOH, and the community on a voluntary basis.

2.2.1.3. Secondary Settlements

Objective:

To provide reliable and safe water supply to four secondary rural centres located in the Province. These secondary centres contain more concentrated populations of about 3,000 persons.

Supplies are expected to operate on the basis of cost recovery.

Presently, three of the four schemes have been completed, and the fourth is under design.

Technology:

Communal stand-pipes are provided through a reticulation network supplied from boreholes or surface water. Pumps are driven by diesel generator or solar panels. Handpumps are being considered as an alternative for the scheme presently under design.

Delivery:

These schemes have been designed and installed on behalf of the communities by the DWA, using the same methodology as for the township supplies. Designed to be low maintenance, support is however provided by DWA. Management boards have been set-up to supervise operation and maintenance, and manage financial affairs.



Health Education:

It is unclear how far hygiene education and user participation has been purposefully designed into the programme, through the support of the CEP teams.

Cost:

Capital costs are borne by DWA with funds provided by NORAD. Operating costs vary in each village depending on the technology used. In principle, these costs are supposed to be recovered from users.

2.2.2. Township Water Supply

The programme for the townships can be divided into four:

- * 6 District Township Supplies
- * Mongu & Limulunga Township Supplies
- * Sanitation I
- * Sanitation II

2.2.2.1. The 6 District Township Supplies

Objective:

To rehabilitate the township water supply systems and where necessary increase the capacity of the distribution network to high, medium, and low cost plots and to communal stand-pipes (15- 25 households per stand-pipe). Squatter settlements in peri-urban areas, particularly in Mongu have not been fully incorporated into these upgrading activities. Systems have been designed to cater for 1995 estimated populations in Kaoma, Lukulu, Mongu, Limulunga, Namushakende and Kalabo, and 2000 estimated populations for Sesheke and Senanga. The estimated combined population of the townships for 1995 is 180,000 representing 27 % of the total provincial population. Upgrading work was completed in 1985 in all but Sesheke and Senanga, which were completed in 1987.

To build up the operation and maintenance capacity of the responsible authorities, and work towards full cost recovery of operational costs.

Technology:

Water is pumped either from deep boreholes or river intakes to simple treatment works, from where it is pumped along rising mains to elevated storage tanks. Water is supplied to households and communal stand-pipes along supply lines of galvanised steel and asbestos cement pipes. Stand-pipes are normally un-protected, and are fitted with standard bibcock taps or push taps. Arrangements are underway to install water meters at all private, institutional, commercial and stand-pipe facilities.

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Delivery:

Design and Construction: Consulting engineers were commissioned to carry out design work based on the recommendations of an earlier pre-feasibility report. Construction work was carried out by local contractors with the exception of the Senanga, Sesheke, Limulunga and last stage of Mongu scheme where a direct labour system was used. There has been no community participation.

Operation and Maintenance: Township water supplies are maintained by the Department of Water Affairs, with the exception of the Mongu/Limulunga supplies which now fall under the authority of the Mongu Water Works, a semi-autonomous organisation belonging to Mongu District Council. DWA operates through District offices headed by an officer-in-charge, and supervised by a township water engineer based in the provincial office. The Mongu Water Works is managed by a Water Engineer employed through the District Council. Participation of the community is limited to the payment of monthly water charges, and to the maintenance of communal stand-pipe facilities. It is proposed that in the future, the cost of repairs will also fall on the user. Water committees have been established to supervise use of water and the collection of fees.

Health Education:

Health education has been recently introduced through the Sanitation I pilot project, described below. This educational component is directed to stand-pipe users only.

Cost:

Design and construction costs have been paid for by NORAD. Operation and maintenance costs are intended to be recovered through the collection of water tariffs from the consumer. To date, the shortfall between actual costs and revenue received has been paid for largely by NORAD, and to a lesser extent by GRZ. The Mongu and Limulunga schemes receive no financial support from GRZ through their Council. Through bi-annual tariff increases, and increased efficiency in revenue collection and cost control, it is planned to achieve full cost recovery between 1995 and 1997.

2.2.2.2. Sanitation I:

Objective:

To improve sanitary conditions around communal stand-pipes in townships through a community participation approach. This project is being piloted in 2 selected townships. It is proposed to extend the project to other townships.

Technology:

Construction of concrete slab and soak pit around the stand-pipe. Materials consist of approximately 5 pockets of cement, sand, gravel, plastic sheeting and reinforcing steel mesh.

Delivery:

The project is community-based and is supervised by a member of the district CEP Team. Participation is voluntary, and is subject to the communal stand-pipe committee requesting assistance, and paying a ZAK 150.00 fee. Materials are provided by the project and labour by the



committee, which cast the slab and construct the soakpit under supervision. Hygiene education discussions are held with each committee, with inputs provided by available extension workers. Committees are supposed to be visited on a monthly basis.

Operation and Maintenance:

Stand-pipe users are expected to maintain the area, and make necessary repairs, with funds raised by the committee.

Cost:

NORAD presently funds the cost of materials for which the community contributes a token fee. Labour is provided on a voluntary basis by the community. Maintenance costs are also borne by the community, should repair work be required.

2.2.2.3. Sanitation II

Objective:

To pilot a community-based latrine and hygiene education project in the peri-urban areas of Mongu township.

To construct 10 demonstration latrines and 80 community built latrines in Kapulanga compound, with a view to further replication in the township.

Technology:

The latrine developed for this pilot project is based on the VIP latrine; the substructure comprises a 3 meter deep, cement block lined pit, and a 2 metre X 2 metre reinforced concrete slab cast in-situ. Superstructures can be built from any kind of material, and include a doorway. A 3 metre black PVC ventpipe and flyscreen are fitted into the slab.

Delivery:

The project is supervised by the Provincial Health Inspector, and coordinated in the field by a Health Assistant. A construction Team of between 4-6 builders and labourers, are supported by a pick-up truck and driver. The Provincial Health Inspector reports to a Sanitation Support Unit, which provides technical guidance. Progress reports are submitted to P-WASHE.

Community mobilisation has been carried out through the construction of demonstration latrines, and door to door campaigns by the Health Assistant. Households interested in participation are asked to group together (maximum 6 households) to apply for a latrine. A latrine committee is formed by the households to organise support to the construction of the latrine.

The pit is excavated by the householders under supervision. The project Team lines the pit with blocks manufactured by the householders. A reinforced concrete slab is cast in-situ on top of the lining. All materials are provided by project funds.

The householders are then required to construct the superstructure. Bricks, wood, reeds are used

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according to householder preference. The project provides guidance on construction techniques and may provide transport to collect building materials. A ventpipe and flyscreen are supplied by the project once the superstructure is complete.

Operation and Maintenance:

Latrine committees are charged with the responsibility to maintain and clean the latrine. Once the pit is full, householders will be required to build a new latrine. Where possible, materials should be salvaged from the full latrine. Presently, there is no commitment on the part of the project to assist in the construction of a new latrine.

Hygiene Education:

Hygiene education is provided by the Health Assistant. Presently, teaching aids have not been developed to support project activities. Plans have been made to conduct a utilisation study to assess community acceptance of the project.

Cost:

The project pays for the materials and labour required to build the substructure, for the ventpipe and flyscreen for logistic support and supervision. The recipient householders must excavate the pit, assist in the moulding of blocks, and curing of the slab and must provide materials for, and build the superstructure.

Project costs are paid by NORAD and amount to between 400 and 450 NOK per unit. Costs to the community are variable depending on the kind of materials used.

Chapter 3

THE ZAMBIAN CONTEXT

3.1. Country Profile.

Zambia is located in the central part of southern Africa. Comprising a surface area of 572,620 square kilometres, it is completely land-locked being bordered by Tanzania, Malawi, Mozambique, Zimbabwe, Botswana, Namibia, Angola and Zaire. It obtained independence in 1964.

According to the 1990 census, Zambia has a population of 8 million. The population has been increasing rapidly. Results from the past four censuses indicate that the population increased from 3.5 million in 1963 to 4.1 million in 1969, 5.7 million in 1980 and 7.8 in 1990. The population has thus doubled itself in the 21 years between 1969 and 1990. The main features of the Zambian population include: high urbanisation (43%), high population growth rate 3.2% per annum, high fertility rate of 6.5 and a large part of the population under 15 years of age. Population density per square kilometre is on average eleven persons. Regional variations range from 4 to 40 persons per square kilometre.

The Zambian economy has always depended on the mining sector, particularly copper. At independence, and for several years after, copper prices in the international market were high. As a result, the economy grew rapidly so that Zambia was among the strongest economies in sub-saharan Africa. However, due to world-wide recession beginning in the mid-1970s, copper prices and exports declined substantially reducing Zambia's earnings from exports and forcing cut backs in imports as well as government expenditure especially in social services (i.e. health and education). In 1990, Gross Domestic product at current prices was Kwacha 113,341 million and per capita national income was Kwacha 14, 494, placing the country amongst the poorest on the African continent.

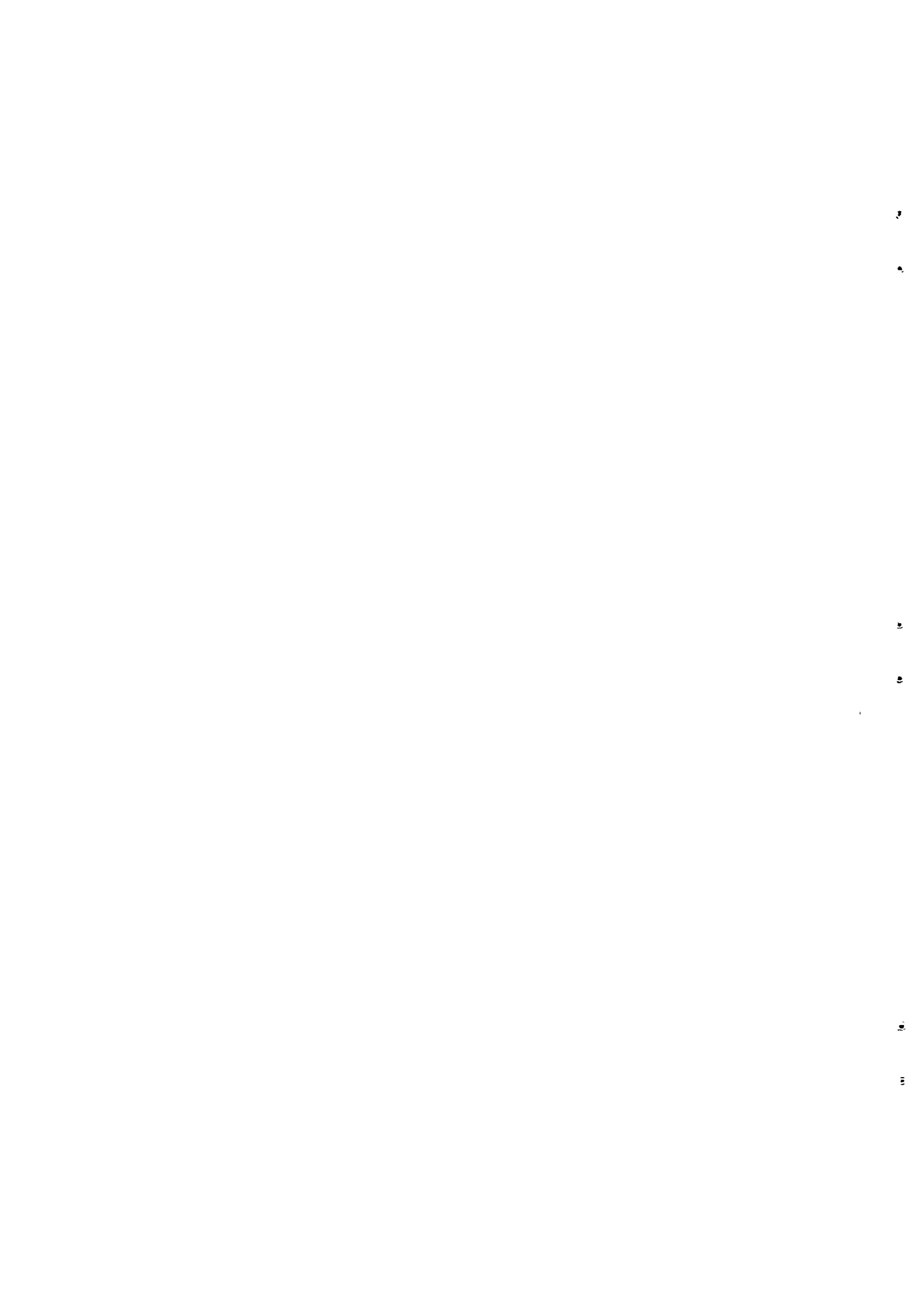
With enormous external debts accumulating, rampant inflation and near bankruptcy, the country has now negotiated a structural adjustment plan with the IMF/World Bank and other donors, as a basis for re-building the economy. Social and economic hardship has been further exacerbated by the recent drought, which has devastated the traditional and commercial agricultural sectors.

Western Province

Zambia has nine provinces with distinct geographical and ethnic groupings. The province which is the focus of this study is Western province which shares borders with Angola, Namibia and Botswana, and with North-western, Central and Southern provinces.

The Western Province of Zambia covers an area of 126,386 square kilometres which represents 17% of the total surface area of the country. The province sits on top of the north-eastern portion of the Kalahari desert, sloping from 1,200 meters above the sea level in the north-west to 800 meters in the south-east.

The Province has six districts; Mongu, Kalabo, Kaoma, Senanga, Sesheke and Lukulu. According to census data the population for Western Province grew from 410,087 in 1969 to 486,455 in 1980 and to 607,000 in 1990. Approximately 75 % of the population are rural, which is considerably higher than the national average. Of importance to note is that most settlements in the province especially in the Zambezi plain consist of scattered populations. The demographic characteristics of the Western Province



especially in view of low population densities and large distances raises constraints to development.

The province is bisected by the Zambezi river and flood plain. Because of this feature, communication to the western part of the province poses serious problems, and as a result some areas (especially most of Kalabo, Mongu and Senanga) are inaccessible for 3-4 months during the annual flooding of the plain. Transportation systems by road or water are not well developed. Only three roads are tarred (Lusaka-Mongu, Mongu-Senanga and Mongu-Limulunga). All other roads are extremely sandy requiring 4-wheel drive. There are also few bridges and ferry boats to transport heavy equipment such as trucks and drilling rigs.

3.2. Health Profile.

Water supply, sanitation and community health status, especially that of children and women, are closely interrelated. Poor water supply and sanitation make individuals, especially children, susceptible to diarrhoeal diseases and malnutrition. When access to safe water supply is interrupted, incidences of water related diseases such as dysentery, and skin infections i.e., scabies increase. Diarrhoea and malnutrition have also been associated with other diseases such as measles, tuberculosis and AIDS.

Health status is influenced by an array of socio-economic and demographic conditions prevailing in any country (i.e nutrition, medical technology, size of population in relation to national capacity, cost of living and general living conditions). However, the effects of public health standards especially as measured by availability of improved water supply (both quantity and quality) and sanitation on community health is undoubted.

Conventional measures show that the quality of life in Zambia is low as is the case in most developing countries. Women and children are the most vulnerable. For example more children than adults suffer from malnutrition and diarrhoeal diseases. And although women live longer than men (55 and 53 years respectively) they suffer from sickness more than men do.

One major indicator of poor public health is the incidence of excreta and water related diseases (i.e., diarrhoea, dysentery, bilharzia, scabies). The majority (about 60%) of the population in rural areas still depend on unprotected traditional water sources (rivers, streams and hand-dug wells). In rural areas, sanitation is generally unsatisfactory. Most villages are lacking latrines and refuse pits.

National and provincial data show that major causes of morbidity and mortality in Zambia are due to environmental and behavioural causes. Most of these are directly or indirectly water and excreta related. For example, diarrhoea and other gastro-infections could be directly linked to contaminated water or food. Eye and skin infections though not specifically classified could be a result of inadequate water supply to maintain good hygiene. Data on Table A show that 52.8 % of morbidity is due to water borne/washed diseases. Laboratory investigations also indicate that parasitic infections such as hookworm, and skin infections such as scabies are common in Western Province. Parasitic infections seem to be more common in Kaoma district which has limited access to natural water supplies. Hookworm infections may be due to poor excreta disposal and askaris infection may result from poor hygiene such as lack of hand-washing or vegetable washing especially when water is limited.

Table A summarises the major causes of morbidity and mortality in Zambia and indicates that 9 % of deaths among children under 15 years are due to diarrhoeal diseases. Note that deaths due to diseases associated with diarrhoea i.e., malnutrition, measles and anaemia is quite high 31%, 9% and 8% respectively. Also note that these figures do not reflect the magnitude of the problem because there are many children who die before they reach the hospitals.



Table A.
 Top Ten Causes of Admissions and Deaths in Hospitals
 1988 1 - 14 years.

Diagnosis	Admissions	%	Deaths	%
Malaria	49218	34,4	920	09,3
Malnutrition	14657	10,2	3105	31,3
Accidents	13610	09,5	223	02,2
Diarrhoea	9066	06,3	916	09,2
Anaemia	8303	05,8	781	07,9
Measles	7884	05,5	914	09,2
Pneumonia	7514	05,2	766	07,7
Skin Diseases	5707	04,0		
Tuberculosis			189	01,9
Avitaminosis			149	01,5
Total	952780	100	1959	19,7

Source: GRZ. Ministry of Health. Bulletin of Health
 Statistics, 1978-1988. p74



Chapter 4.

TOWNSHIP WATER SUPPLIES.

4.1. Design and Present Status

The township water supplies can be divided into two categories:

1. Mongu and Limulunga water supplies.
2. the 6 DWA township water supplies.

In addition, the Township programme has incorporated two pilot sanitation projects.

Up to 1989, NORAD had invested a total of NOK 172 million in upgrading the township water supplies in Western province. The investments appear in the table below:

TOWNSHIP	POPULATION 1980	EST. POPULAT. 1995	DESIGN POPULATION	INVESTED 1000 NOK
Kalabo	7 400	10 000	12 000	24 210
Kaoma	6 700	10 000	14 400	18 314
Lukulu	1 500	2 800	5 000	8 612
Namushakende	1 900	3 000	3 200	12 053
Senanga	7 200	8 800	10 000	8 021
Sesheke	3 500	9 000	10 000	9 038
Mongu	25 000	96 000	96 000	75 693
Limulunga	12 000	23 000	23 800	16 291
Total	65 200	163 400	174 700	172 232

4.1.1. Mongu & Limulunga

Mongu township water supply was in 1983 augmented from a capacity to serve 25 000 people to a capacity to serve an estimated 1995 population of 43 000. A few years later (1987) it was evident that the population growth in Mongu had already passed this level. The water supply system was again upgraded and designed to serve a revised 1995 population estimate of 96 000. This projection seems to be close to what can now be expected.

With all pumps running the Mongu Water Works (MWW) at present is able to produce 450 m³ per hour, or approximately 10 000 m³ if the pumps are running 24 hr. With one pump out of order and electricity available only 18 hr a day, as is the case presently, the production drops to 7000 m³ a day. Even with a water loss of 25-30%, which could be considered acceptable, an average family could draw up to 200 litre per day. In theory the water supply in Mongu therefore can provide a reasonable service to a population of 96 000.



The present situation can briefly be described as follows:

- 50 % of the produced water still disappears in different leakages around the town although, in one year MWW has managed to reduce the losses from the previous 60 - 65 % to the present 50 %.
- There is still an imbalance of water distribution and hence there are still water shortages in different parts of the town.
- None of the served areas are, however, completely without water.

It can therefore be said that the situation in Mongu has improved, even if it is far from being perfect. The higher located areas are normally the first hit when water leaks out of the system. As an example, a high cost housing area like the Hilltop, where the Provincial and the District Council's headquarters are located, experience regular shortages. This causes criticism and allegations from the higher echelons of the town's population that the water supply system has not been properly designed. The reticulation system in this area is old, corroded and poorly designed without proper planning to enhance optimal use of the available supply.

In areas where the consumers are served from communal stand-pipes the water supply is on the other hand physically closed during the night. A relatively high proportion of the leakages stem from these areas and to secure the water supply at the Hilltop the MWW administration closes the supply to the lower areas where the stand-pipes are.

According to studies made earlier (Skarstol, 1987), water losses through leakages amounted to as much as 60-65 % of the total amount of water supplied from the boreholes. It was also discovered that a majority of the losses were caused by the consumers being careless or ignorant of the consequences. After the establishment of MWW, the organisation has been actively trying to reduce the water losses and in trying to distribute the water evenly to all parts of the town. The water losses have three major implications: one is capacity limitations and water shortage due to high "consumption", the other is excessive revenue expenses for the consumer, where water is metered , and the third is reduced revenue income if the consumers pay a flat rate.

4.1.2. The DWA Township Supplies.

The Department of Water Affairs through the Provincial Water Engineer (PWE) operates and maintains the following township water supplies in Western Province: Kalabo, Kaoma, Lukulu, Namushakende, Senanga and Sesheke

Between 1982 and 1987 all township water supplies were constructed or augmented with funds from NORAD. While the first four were designed for a population projected to 1995, Senanga and Sesheke were designed for a population projected to the year 2000.

The design of the township water supplies is standardised and relatively simple. It can briefly be described as follows:

A pumping station pumps water from the source to elevated storage tanks. From the storage tanks the water gravitates into the township's reticulation system and on to the consumers. Three townships; Sesheke, Senanga and Kalabo have river intakes and three townships Kaoma, Lukulu and Namushakende are supplied from boreholes.



Two design principles have been used:

- a: The water is pumped directly from the boreholes through pressure-filters (sandfilters) to the storage tanks.
- b: The water is first taken from the source (borehole or intake well) via filters and chlorination to a clearwater well. From the clearwater well the water is then pumped to the storage tank(s).

All pumps are electrical and power is supplied from the national electricity supply system (ZESCO).

The water supply to consumers are grouped as follows:

- a) High cost house.
Floor > 120 m², good finish, multiple taps, water borne sanitation. Calculated consumption 280 l/c/d (50 m³/month).
- b) Medium cost house.
Floor 60 - 120 m², average finish, multiple taps, water borne sanitation. Calculated consumption 150 l/c/d (27 m³/month).
- c) Low cost house.
Floor < 60 m², basic finish, limited number of taps, water borne sanitation. Calculated consumption 100 l/c/d (18 m³/month).
- d) Single tap house.
One tap on the plot, pit latrine sanitation. Calculated consumption 50 l/c/d (9 m³/month).
- e) Communal tap house.
More than one household sharing a tap or a communal standpost, pit latrine sanitation. Calculated consumption 30 l/c/d (5 m³/month)
- f) GRZ- institutions .
Non-profit consumers (schools, hospitals, clinics, prisons, public offices etc.). Calculated consumption by size and standard.
- g) Commercial consumers.
Profit making consumers (parastatals, industries, businesses, private offices etc.). Calculated consumption by size, type and standard.

Up until July 1992, none of the townships were able to cover their O & M expenses from revenue earnings. From July, Kalabo township has been able to increase revenue income to approximately the direct O & M costs. The present actions taken by DWA to increase tariffs, introduce better water use control, meter all major consumers etc. indicates that within two to three years the DWA townships will be able to cater for their normal Operation & Maintenance costs. The Namushakende water supply is however extremely expensive compared to the other schemes, on a per capita basis. It has a very high lift of the water and hence high production cost. The O&M expenses at Namushakende are close to ZAK 15/m³ (1992) compared to the average of ZAK 7,3 /m³. It can therefore be questioned if the Namushakende water supply will ever be sustainable.

All water works are in a reasonably good condition. Provided the water departments, look at the income potential and are more cautious in extending the reticulation system beyond the present capacity, and are more effective in curbing water loss and collecting revenue, there is a chance that the water supply systems can provide adequate service beyond the design years.

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The present flat rate water tariffs vary between the seven consumer categories. These tariffs do not however reflect the different consumption patterns of different consumer groups. By installing water meters it has been revealed that commercial, institutional and High/Medium cost house consumers, up to recently, have only been required to pay for a fraction of the water they have consumed. The income potential for the water departments will be drawn primarily from these consumers. Therefore, to maximise income from water sales (particularly metered) these consumers should be given adequate water supply from the townships' water departments.

There are two issues that at present concern the township water supplies:

- i) The pumps installed in the early eighties are running towards the end of their "lifetime". Replacement will therefore be needed in the near future.
- ii) The townships are expanding and extension of the reticulation system will become necessary. A consequence of this is that the capacity of the schemes may soon be exhausted, with a cry for increased capacity resulting.

Regarding the first issue, the replacement of worn out machinery is an integral part of operation and maintenance. The problem for the Water Departments is that such replacement requires FOREX and sufficient income to pay for the expenses related to the investment. It is not foreseen that the townships will be able to retain enough revenue to cater for major overhaul before 1995-96. Assistance from a donor is therefore needed.

Regarding the second issue, a tighter control on the financial consequences of expanding the serviced area is needed if the objective is to provide a sustainable water supply system. Improved services to institutions and high cost housing areas can be profitable, but expanded services to areas where the ability to pay is limited will result in a relatively high proportion of revenue income having to be spent on cross-subsidisation, instead of providing increased income for the water supply scheme.

In low-income peri-urban areas where settlement is primarily informal, alternative ways of providing water supply by means of boreholes and handpumps (as in the rural areas) should be considered. With the experience and the impressive results gained in the rural water supply programme, (see ch.5), the CEP teams will most likely be able to promote a similar development in low cost water and sanitation in the townships.

4.1.3. Sewerage and Sanitation

As far back as 1979, a draft feasibility study into upgrading of sewerage and sanitation installations in Mongu was carried out. To date no action has been taken. More generally, the sanitation sector has hardly figured in the 15 year history of the programme.

In the documentation made available to the Team sanitation seems not to have been considered as part of the improvement of the Township Water Supply before the present phase V. Sanitation still plays a minor role in the programme and only a relative small amount of money has been allocated for this purpose to the two sanitation pilot projects.

There are, however, serious problems with the existing sewerage facilities, particularly in Mongu, whilst, in general, in all townships, the percentage of households with access to any form of toilet, is still unacceptable low.

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Within Mongu, the following problems pose potentially serious public health risks:

- * Sewage draining into the wellfield area from septic tanks on the hillside above the wellfield,
- * Sewage flowing through the squatter area at Limulunga La Molena where the sewerage system from the Boma area has been totally destroyed.
- * Public toilets at Limulunga La Molena previously connected to the sewage system, now discharging directly into the community.
- * Neglect of the school and hospital sewage ponds, in the centre of town, which are causing odour nuisance and contamination of surface water.

The absence of a coherent sewerage and sanitation component in the overall programme in the townships has clearly compromised the impact that the programme could have made in relation to improving environmental health conditions.

The full extent of the programme's commitment to the sector, consists of the Sanitation I and Sanitation II pilot projects. These are recent innovations and therefore their impact is limited. The Sanitation I project is sound and should be replicated to all townships. The Sanitation II project must first undergo a considerable research and development phase before any replication can be considered.

4.2. Organisation and Institutional Matters.

4.2.1. Mongu and Limulunga

According to a national directive from the early eighties, the District Councils were supposed to take over the responsibility of operating and maintaining the township water supplies falling within their respective districts. Within Mongu district there are three town water supplies - Mongu, Limulunga and Namushakende. The District Council has taken over the responsibility for Mongu and Limulunga while Namushakende is still operated by DWA through the PWE in Western Province.

Indications are that Mongu District Council for many years did not see operation and maintenance of the water supply as a priority area. It appears that since NORAD had agreed to master the rehabilitation of the schemes in Mongu and Limulunga, there was little perceived need for operation and maintenance. Until 1990, it also seems that NORAD was not too concerned about the absence of a firm institutional structure to take over the rehabilitated schemes. This has been confirmed by the fact that the conditions for funding the rehabilitation of the old water supply system were not pursued.

Only when NORAD in 1990 presented a set of firm conditions for further support to Mongu District Council, did the Council then decide to take steps to improve operation and maintenance. Until 1990, the Council had relied heavily on assistance from DWA. In fact, a separate account is still kept by DWA to support Council water supply activities. The funds in this account are provided by NORAD.

In 1991 the Council established a semi-autonomous water supply organisation, hereafter called the Mongu Water Works (MWW). MWW has a water engineer as manager and a staff of about 50 persons in different posts in Mongu and Limulunga.

Operation and maintenance of Mongu and Limulunga water supplies rests with the Mongu Town Water Engineer. In Mongu this consists of the maintenance of 10 submersible pumps (Grundfoss) in boreholes down to a stable aquifer balanced by the water table in the Barotse Flood Plain. The water reservoir in this aquifer is most likely far beyond the needs of Mongu. The yield of the individual borehole will, however, depend on aquifer's capacity and the status of the borehole. The boreholes therefore have to be

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constantly monitored and refurbished as necessary (this is usual for boreholes) to ensure that full capacity is maintained. The clear-water well (to which the borehole pumps supply water), the chlorination equipment and the high-lift pumps (KSB) which supply water from the well to the different storage tanks, also require regular maintenance, and routine monitoring.

The Water Engineer and his staff also have the task of controlling even distribution of water to the different parts of the town. To achieve this, the feeder and the reticulation systems have to be continuously monitored, maintained and repaired.

The present organisation is a subsidiary of MDC. The Council therefore has the responsibility to make MWW a sustainable entity. Since 1990, the MWW management has improved, and with an assistant water engineer, it will be possible to establish separate administrative and technical sections. At present indications are that MWW, will in the future, on certain conditions, be able to manage and maintain the water supply systems in the two townships. One of the main conditions is that MWW will be given the possibility to operate on a commercial basis.

Another condition is that MWW will be allowed to obtain professional and technical support from the Provincial Water Engineer (PWE). Such support may be hydrogeological, design or engineering services. With DWA almost next door, MWW should also have access to their workshop.

Sustainability.

Defining sustainability as the ability to operate and maintain an installation without external support, MWW at present must be regarded as **not** yet sustainable.

In order to operate and maintain this intricate system of pumps, tanks, pipes, and valves, funds are needed. Two thirds of the expenses are related to staff salaries. To make the O&M system cheaper it has to be more efficient in terms of manpower. Almost all other expenses except for energy are minor in comparison to manpower costs.

At present there is a deficit of ZAK 4-5 million between expenses and revenue. This deficit has to be covered from sources outside the water supply system.

A report of May 1991 (Ronningen/Lifumbo) indicates that MWW can be profitable (and sustainable) as from 1999 by gradually increasing the 1991 tariffs. On the other hand DWA has drawn up a programme where township water supplies will be self-sustainable as from 1997. Mongu town has still lower water tariffs than DWA, but will soon bring them to the same level.

Excluding capital cost and depreciation, the production cost for water, in Mongu 1991 was ZAK 5.58 million, and in Limulunga was ZAK 1.48 million. For Mongu and Limulunga the cost of one m³ should then be about ZAK 2.3 (NOK 0.07).

From January to July 1992 the O&M expenses went up to ZAK 7.5 million increasing the price per m³ to almost ZAK 6.0. With present losses (50%) the actual water tariff in 1992 (January tariff) for a household consuming 10 m³ per month (single tap household) should therefore be ZAK 120.



Conclusions

A summary of achievements made, and of outstanding areas of concern follows:

Achievements

- a. MWW has been established as a separate financial and operational unit under MDC.
- b. Qualified staff have been employed and the organisation is working.
- c. Water loss has been reduced.
- d. Revenue collection has improved.
- e. The control of water use and misuse is improving.
- f. Water tariffs are increasing.

Areas of Concern

- a. Revenues cover only 60 % of O & M cost.
- b. MDC is not able (or willing) to cover the deficit.
- c. Water loss is still 50 % of produced amount.

4.2.2. The DWA Townships

A basic operational structure has now been established to run the township water supplies.

At provincial level, a post of Water Engineer (Townships), reporting to the Provincial Water Engineer, is established, localised and paid for by GRZ. The incumbent is responsible for supervising the operational and maintenance duties of the officers-in-charge posted at district level, including revenue collection. He also supports the Provincial Water Engineer in preparing budgets, attending to policy matters, and undertaking limited design work for rehabilitation and extension to the supply systems. The Engineer is also supported by the workshop and supplies section, which service the districts, and which from our inspection, is efficiently managed. Here, the workshop superintendent (expatriate) is confident that local capacity has now been built up to continue efficient operations.

Presently, the province receives backstopping support from DWA headquarters through their Senior Water Engineer, a position presently held by an expatriate. In this regard, and in contrast to the rural project, and indeed, Mongu Water Works, the township supplies are part of a nationally coordinated programme (47 schemes in all), particularly regarding operation and maintenance procedures and more significantly cost recovery. However, the status of the actual water supplies and the efficiency of operation and maintenance throughout the country varies tremendously, and is in large part a function of the level of donor input obtained - Western Province being a good case in point.

At the district level, the officer-in-charge is responsible for the township water supply. The incumbent is supported by a revenue officer, and a basic technical team comprising plant operators and artisans. A majority of positions are now established, localised and paid for by GRZ, although in Kaoma district, we learned that the revenue collector, for example, is still set against a project post. It is felt that the existing establishment is adequate to meet the needs of the present township water supply schemes. A separate supervision vehicle for the townships could however facilitate communication.

As stated earlier, community involvement in the operation and maintenance of the schemes is limited. However, communal stand-pipe users are expected to maintain their facilities and to pay for water consumed. Accordingly, water committees have been created. Generally, support to these committees is modest, as compared to the kind of support built into the rural programme, and from discussions, it is felt



that the difficulties of community management have been underestimated.

The part of the operations least integrated into the GRZ system, and which retains a distinct project status is that of disbursement of funds and procurements. Presently, a large portion of procurements depend on FOREX payments. This accounts especially for spare parts both for the water supply systems, for vehicles and for workshop equipment, for which local availability is limited. Procurements are therefore prepared by the province and transmitted via the Director of Water Affairs (for counter signature) for action by NORAD's appointed agent, ScanAfrican Trading. Supplies received are directly supplied to the Province. Where locally available supplies can be obtained, then GRZ procurement procedures are observed. This situation is likely to continue so long as it is not possible to substitute imports, and so long as GRZ is not able to obtain foreign exchange.

4.2.3. Sewerage and Sanitation.

The absence of a sanitation component is due in large part to institutional divisions of responsibility, and poor coordination which have fragmented the sector. Sewerage is apparently the responsibility of the Ministry of Public Works and Supply, and sanitation of the Ministry of Health. Councils also have statutory responsibility to provide refuse collection and a vacuum tanker service. Unlike the rural programme which has successfully established an interministerial committee (WASHE) to guide activities, the same cannot be said of the township programme. So long as DWA has been the client Ministry, those responsible for the sewerage and sanitation aspects have not participated in the decision-making process. It is only in recent years that the Ministry of Health has assumed charge of the pilot low cost sanitation project in Mongu. Remedial action regarding sewerage installations are long over due having been identified as far back as 1979, and yet there is no evidence of any form of participation by the Ministry of Public Works and Supply. It is imperative that this Ministry is brought into a committee structure so that a plan of action can be made to attend to all outstanding remedial work. The situation outside Mongu is less serious, but there are specific areas which also require attention.

In this respect, the programme in the townships is a water and sanitation programme in name only. In institutional terms, it has been almost exclusively a DWA concern.

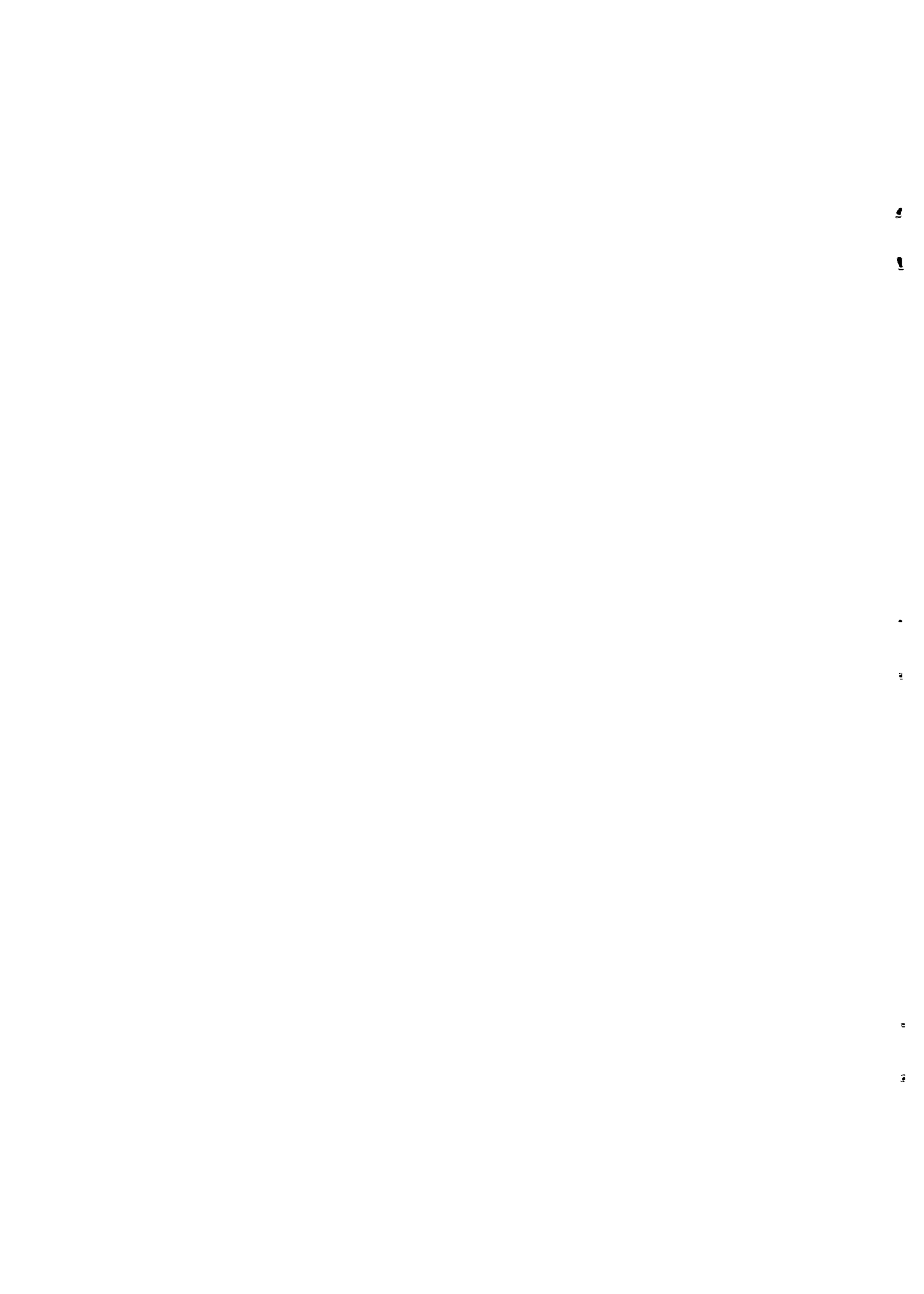
Sanitation I:

The introduction of this pilot project has introduced a much needed linkage between the agency responsible for water supply provision - DWA, and the consumer of communal water supplies.

The linkage is provided by a CEP Team member and fellow extension workers, who are introducing the concept of community management of stand-pipes, and of environmental sanitation. This, too, is an important initiative in terms of establishing a health and hygiene element into what has otherwise been a technology- orientated venture. The progress made here at the operational level, needs now to be copied at the planning and decision-making level, so that township water supply can be examined in the broader context of environmental health.

Sanitation II

This pilot project has been handed to the Ministry of Health for implementation, as that Ministry is understood to be responsible for general sanitation matters. The pilot project is nevertheless a component of the overall programme in the province, and as such, progress is reported to the P-WASHE committee, whilst technical matters are referred to a Sanitation Support Unit, which includes representation from the relevant line ministries. The support provided by these two intersectoral bodies should ensure that the



pilot project receives the level of attention that it deserves, and is not pigeon-holed as a concern, solely for public health workers. This point is emphasised given the past experience of the programme which has failed to recognise the complementary nature of water supply and sanitation activities.

The Team was impressed by the level of commitment given by the coordinators of the project. There are also indications that they are receiving satisfactory support from the community. The project has set itself the ambitious task of calling on the community to share a family latrine between six households. However, from brief discussions with several householders, it would appear that this task has prompted them to organise user committees to share responsibility for cost and maintenance. It is nevertheless premature to assess the degree of acceptance and sustainability that this approach is likely to enjoy.

On the other hand, there are indications that the project implementers have not solicited, or have not received the level of technical support that is demanded of a pilot project. In this respect, the Team is of the opinion that techniques and materials developed by the CEP teams could be usefully applied to this project, and advantage could be gained of linking the project to the Sanitation I pilot project. Further, there is considerable research required to refine latrine technology, and here, assistance to the project coordinators from engineers is needed.

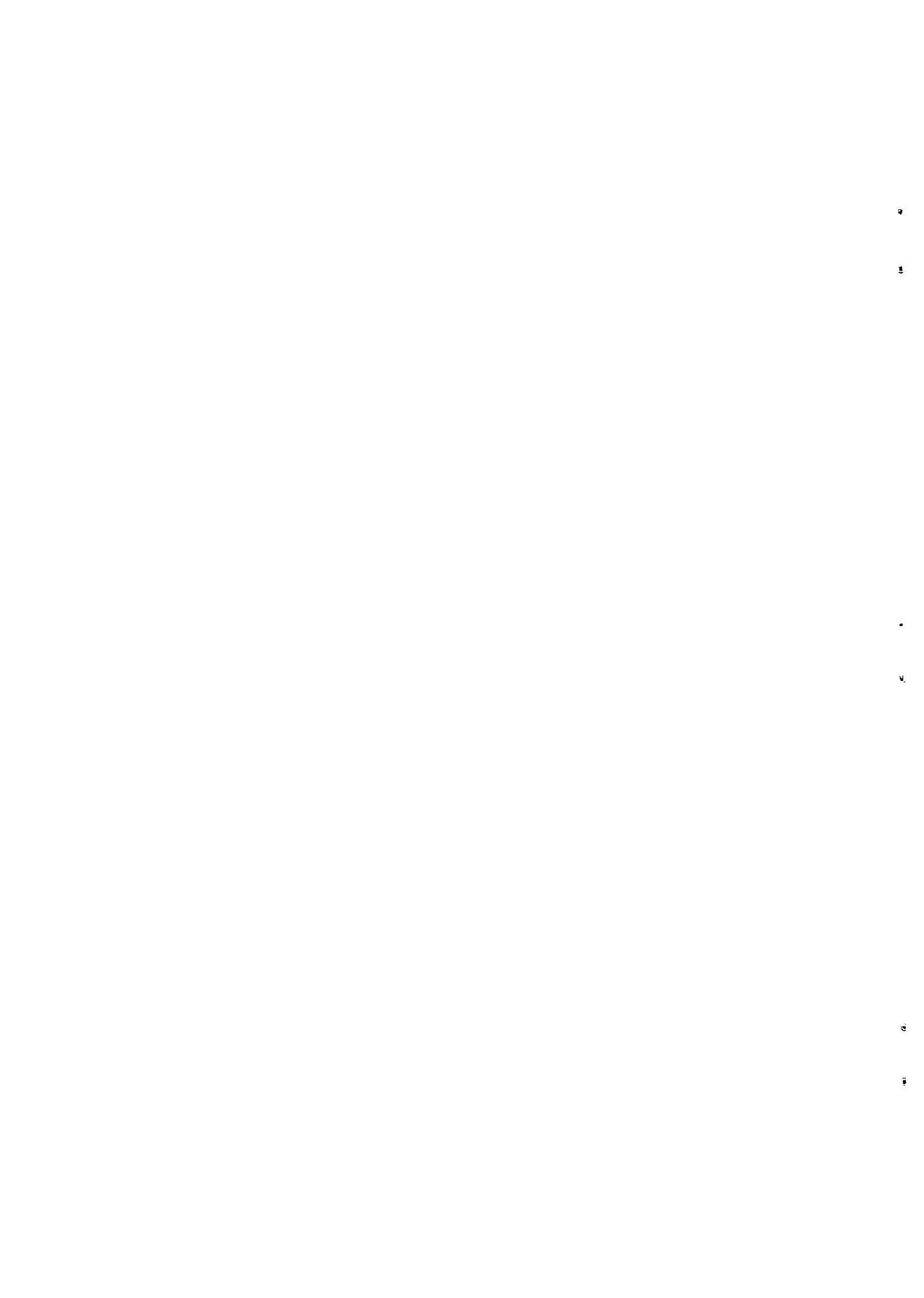
4.3. Impact and Social Issues

4.3.1. The Township Water Supplies

Access

Township water supplies have been designed to provide a level of service consistent with standards adopted by the Department of Water Affairs. Provision to high cost houses is based on 1.7 m³ per day, medium cost houses 0.9 m³ per day, low cost houses 0.6 m³ per day, and communal stand-pipes on 30 litres per day per capita. Low, medium and high cost plot holders can apply for on-plot connections, while traditional areas have access to communal stand-pipes distributed on the basis of ward sections. On average, between 15 and 25 households share such a communal facility, with walking distances rarely exceeding 50 meters. It is only in some parts of Mongu township, where because of distribution difficulties, which have been discussed already, some private and communal tap consumers receive erratic supplies. Otherwise, township supplies should have capacity to meet demand until the year 2000, with perhaps Mongu as an exception. In terms of geographical coverage, the reticulation network has been designed in principle to reach consumers residing within the designated township boundaries. DWA claim to provide service to approximately 90 % of township dwellers. On this point, there are a number of problematic issues. First, there are those instances of plots located outside the township boundary, where occupants have requested to be connected into the system, or which "illegally" already draw water from the nearest stand-pipe. Second, in the case of Mongu, Council authorities have proceeded to allocate plots in un-serviced areas, without due consultation with MWW to determine the feasibility of extending water supplies to such new plots. Third, there are the squatter settlements on the township peripheries, again primarily in Mongu, where there is apparently no clear Government policy on whether such settlements should be recognised, and if so, whether to provide services. In the case of Mongu, reticulation has in some cases been extended into such informal settlements, but not on a systematic basis. It is therefore questionable if access to water supplies in the peri-urban areas is at all adequate.

Actual consumption of water is however very much controlled by consumers' ability and willingness to pay water fees. Township authorities are empowered to disconnect consumers who fail to pay, and this includes communal stand-pipe users. In instances, communal taps have been disconnected for periods of up to 2 months.



Affordability

As discussed earlier, it is GRZ policy that township water supplies should operate on the basis of full recovery of operating and maintenance costs, through the charging of water fees. The difficulty facing the Department of Water Affairs and Mongu District Council, is to reconcile the real cost of providing water with the consumers ability and willingness to pay. This is indeed a complex issue, which both Mongu Water Department and DWA are grappling with. To support this exercise, NORAD/DWA are hiring a consultant to examine tariff matters in more detail, and soon, water meters will be installed. It is therefore expected that a position of break-even can be reached within the next 5 years.

Consumers in the high, medium and low cost categories are most likely to be able to meet higher tariffs although their willingness to pay will be determined in part by the quality of service provided. Of more concern is whether households which rely on communal supplies are able to meet higher charges. Presently, there is insufficient information to indicate whether the real cost of water is affordable to such consumers. For the time being, they are paying, albeit often after the threat or experience of disconnection, but as tariffs are further increased in order to meet costs, water may become unaffordable. It is for this reason that the Team proposes that alternative water supply systems, which are cheaper to maintain may be suitable for low- income areas, so long as policy dictates that the consumers must pay the economic cost of supplying water.

Participation

User involvement in planning and construction has been negligible, since construction work has focussed primarily on upgrading supply rather than distribution. The absence of community participation is not uncommon in urban water supply projects which are perceived as public utilities, responsibility for which rests with the municipality or other government agency. There is a price to pay, particularly regarding the virtual absence of a health education component, of special relevance to communal stand-pipe users who are generally less accustomed to piped water supplies, and where sanitary conditions are more difficult to maintain, especially in the peri-urban areas, and also in relation to a lack of public education about the costs of providing water, maintaining supplies and the consequent need to pay fees.

However, credit is due to more recent initiatives to involve communal stand-pipe users in maintenance of their respective taps. This has become particularly effective where the Sanitation I pilot-project has been introduced in Senanga and Kaoma, as discussed separately below. Even where this project has not been introduced, the authorities are striving to hand-over responsibility for communal stand-pipe management and maintenance to water committees. The social dynamics of community management of a tap have perhaps been underestimated, which has led to difficulties in organising the collection of fees and maintenance of the tap. This was observed during the Team's visit to Namushakende and Senanga.

Health

No empirical work has been undertaken to determine the impact of the township water supplies on the health of the consumers. Nor for that matter was any baseline information on health indicators collected prior to the implementation of the programme. Certain assumptions can be made and conclusions reached based on experience from around the world. The township supplies are capable of providing a reliable and plentiful supply of potable uncontaminated water, assuming that chlorination and filtering procedures are observed and equipment is maintained. The risks of that water becoming contaminated during transport and consumption are least where supplies are by means of on-plot connection. However, in the traditional areas, the risks of contamination are greater, particularly in the more densely settled squatter settlements. Further, residents of such areas tend to be poorer, less well educated and less familiar with piped water supplies which must be paid for. Environmental conditions are generally less sanitary,

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Mongu being a case in point, with evidence of broken sewer lines and very few pit latrines. There is particular cause for concern over the health risks associated with the dilapidated sewage treatment facilities, discussed in earlier sections of this chapter. Although described as a water and sanitation project, the township supply programme is conspicuous for its neglect of sanitation, in spite of recommendations contained in earlier evaluation reports, and therefore, the health benefits of improved water supplies in such areas are questionable. At the same time, in comparative terms, the availability of clean water from stand-pipes in peri-urban areas represents an improvement over the use of un-protected traditional sources which are especially vulnerable to contamination in densely settled areas. The Team was, however, not able to determine if their are sufficient taps to ensure that such traditional sources are no longer used.

4.3.2. Sanitation

The introduction of the Sanitation I & II pilot projects in the townships is the first indication of an awareness that environmental health has to complement improved water supply.

Sanitation I

Although representing only a minor input to the overall development of the township water supplies, this pilot project may have far-reaching consequences for the utilisation of communal stand-pipe water.

Introducing a sense of ownership and responsibility for a communal tap in a township environment presents more difficulties, than may be the case in a rural community setting, since it is too easily associated with the agency responsible for the water supply. However, where cost-recovery for sustainable operation, and improved sanitary conditions are stated objectives, then community participation in the management of stand-pipes is essential. The pilot project can be seen to have provided the following conditions for those objectives to be reached:

First, the project has introduced the CEP concept which has been the key to the success of the present Rural Water Supply Programme. The CEP concept facilitates the process of communication and cooperation with the community.

Second, the project allows the community to develop pride and a sense of responsibility for their stand-pipe, as a result of their direct participation in it's upgrading.

Third, this activity has focussed attention in a tangible manner on environmental sanitation matters, previously not associated with the water supply scheme, while the improvements themselves improve sanitary conditions around the stand-pipe.

Fourth, through the sense of ownership created, and through the formation of committees, the proposition of paying for water and maintaining the stand-pipe at their own cost may become more acceptable.

Sanitation II:

A well organised latrine programme which emphasises improvements in hygiene practices as much as it does the construction of latrines will go far to consolidate the benefits gained from improving water supplies alone. Such a programme demands substantial lead time to assess community attitudes and preferences to the adoption of different latrine technologies, so that an effective health education programme can be developed. Cultural practices and taboos associated with, for example, the sharing of

facilities between the sexes and between adults and children, or indeed between different families must be carefully examined. A community's ability and willingness to pay must also be considered. New technologies which are combined with a financial subsidy can serve as a catalyst towards widespread adoption, but may distort the actual sustainability of the programme. It is necessary to determine how far the technology can be affordable both to the promoting agent, namely government, and the community at large. Social survey work supported by research is therefore indispensable.

Whereas, commendable efforts have been made to launch the latrine pilot project, the Team is concerned that the issues raised above have not been given sufficient attention, and as a result the project may fail to develop a replicable technology. Unless baseline information is obtained now, it will be difficult to make assessments in the future. It is understood that survey work through the medical sociologist attached to the PMO's office will begin shortly, and this initiative is fully supported.

At this early stage in the programme, the tangible benefits obtained thus far are as follows:

First, indiscriminate defecation in the vicinity of those homes where latrines have been built and are being used, has probably been reduced.

Second, community management of latrines has developed amongst those households which have so far participated, and this initiative could be used as a stepping stone for greater community involvement in keeping the environment clean.

Third, through the demonstration effect, improved techniques in latrine construction may be adopted by householders who are not registered in the programme.

4.4. Technology

4.4.1. Water Supplies

From an engineering point of view the technology used in the township water supplies is relatively simple. All township water supplies are constructed with intake and pumps located at one point, direct supply from pumping stations to storage, and reticulation from storage to consumers. In a more technical environment it could be argued that this system is not the most cost/effective but it has proved to be reliable.

Lifting water from underground (borehole or intake well) to a level from where it can gravitate back to the consumers requires machinery (pumps) and energy (electricity). It also requires constant control either manually or automated. The consequence of this is that the consumer has very little influence on how the water is provided. The water becomes a commodity to be traded from the water works to the consumer and the consumer will have to pay either the full cost or a subsidised cost if a source of subsidy exists.

The cost is dependent on production cost, distribution cost and waste. As food either has to be produced or purchased by the user the same goes for water. Choice of technology can therefore not only be based on a technical evaluation of available sources related to the population to be served but also the cost implications compared to the consumers' ability to pay.

The outlay of the supply system is therefore diversified according to consumer categories. At one extreme, consumers with the ability to pay are given a water supply in the house with multiple connections, while at the other extreme, consumers with little ability to pay will have to share a single tap with several other consumers.

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Up to now water has been heavily subsidised in most townships although the source of subsidy has dried up with the consequence of depreciation of the water supply systems and finally in many cases complete breakdown.

In the townships in Western Province the population in that respect have been lucky having a donor willing to take on the deficits caused by low water prices. When the donor now plans to pull out, the consumers will face a considerable increase in the water prices.

For some consumers this can lead to a situation where they can not afford to buy water. In this situation other technological solutions should be evaluated. In the rural areas as many as 200- 300 people share one handpump. There is no cost for energy, administration, storage, distribution etc. The O&M expenses in money terms are spareparts for the pump which normally is a fraction of monthly revenue at a communal standpost. This can therefore be an alternative technology applicable to the low income urban population as well as for rural areas.

It is recommended that this aspect should be looked into in the programme.

4.4.2. Sanitation

The latrine selected for the pilot project is based on the principles of the VIP latrine, namely, pit lining, a sanitary concrete cover slab, ventpipe and flyscreen.

Comments on the particular variation of the VIP latrine that has been developed for this project are presented below:

* The Pit

The pit is sufficiently large to serve a family of 6 persons for at least 15 years. However, the project requires each latrine to be shared by several household. As a result, the life-span of the pit is reduced to about three years. Since access to the pit is not possible, the contents cannot be recovered and therefore the pit has to be abandoned when full.

* The Lining and Cover Slab

The pit is lined with cement blocks to prevent collapse of the surrounding sandy soils. Greater structural integrity could be achieved by constructing circular, rather than rectangular pits. The investment in the lining is considerable, and will be lost once the pit is full.

The cover slab is between 9 and 10 centimetres thick and about 4 square meters in surface area. It is cast in situ, and reinforced, while a drop hole and aperture for the ventpipe are provided. The slab is clearly overdesigned. Further, due to its considerable mass, it is not moveable, and therefore is unlikely to be salvageable when a new pit is dug.

* The Ventpipe and Flyscreen

Presently black PVC pipes are used. This is a function of what was available rather than a function of choice. PVC pipes are known to become brittle when exposed to ultraviolet rays from the sun. Since, most of the ventpipe is contained within the superstructure, the risk of damage is somewhat reduced.

Flyscreens have not yet been obtained. However, we were told that the type of metal mesh used to make mosquito nets for windows has been ordered. This type of mesh perishes after a year or two as a function of exposure to vapour from the pit and heat from the sun.

Considerable research and development is required before a sustainable latrine can be said to have been found. There are fundamental flaws with the present design, which are both technical and economic in nature. Many alternative solutions have been developed in recent years, especially in eastern and southern Africa, and it is recommended, that the experiences of other low-cost sanitation projects are reviewed. In many instances, it has been found that the VIP latrine, is the high-cost option for basic sanitation, and that there are cheaper and more sustainable ways of upgrading the "traditional" latrine. In this respect, recent work has been carried out to develop an ultra low-cost sanitation platform known as the San-Plat.



Chapter 5

THE RURAL WATER SUPPLY PROGRAMME

5.1. Design and Present Status

In chapter 2, a profile of the rural water supply programme was presented. The profile describes the programme as it exists today. Considerable changes have taken place since the programme began in 1977. The most fundamental changes took place following recommendations contained in evaluation reports prepared in 1984 and 1987. While the earlier phase of the programme is not examined here in such great detail, it is however necessary to contrast the fundamental differences between the initial programme and the programme which now operates.

Whereas the early years of the programme have been the subject of considerable criticism, and rightly so, it nevertheless contributed to a process of re-organisation and re-orientation, the result of which is the excellent rural water supply programme of today.

From a review of the literature made available to the Team, and interviews with project personnel, the following conclusions can be reached regarding the programme as it stood between 1977 and 1985:

- absence of plan of operations, although a pre-feasibility study had apparently been conducted.
- absence of defined targets and achievement indicators.
- absence of monitoring procedures.
- absence of socio-economic baseline information.
- absence of community participation.
- un-structured technology research and development.
- absence of continuity in programme management.

The programme concentrated on installing handpumps on jetted wells and on constructing shallow wells. In the absence of any community involvement, and with poor technology selection, the programme achieved little, although in physical terms more than 200 boreholes and 222 shallow wells were constructed, and over NOK 50 million was spent.

The revised programme set out to overhaul the objective and approach of the programme. The transformation has required a gradual process which today is recording success. The key changes brought to the revised programme are as follows:

- introduction of community education and participation as a means of achieving sustainable operation and maintenance and as a means of realising improved hygiene practices.
- rationalisation of drilling techniques and standardisation of handpump models.
- introduction of rudimentary monitoring and reporting systems.



- establishment of basic indicators of achievement.
- introduction of the improved traditional wells project to address needs of smaller communities with access to water close to the surface.

The various features of the revised programme are reviewed in the sections which follow. There are still areas where improvements can be made and approaches refined. These in particular affect issues of sustainability, monitoring & evaluation, and the formulation of measurable indicators of achievement.

5.1.1. Programme Objectives

During the course of the programme's development, objectives have only been stated in the broadest of terms. In reviewing literature on the project, it is difficult to tie the programme down to specific objectives. This is reflected in the project documents, and in the fact that progress reporting has on the whole been unsystematic, with little reference to set targets. Perhaps the best idea of what the present objectives are, can be obtained from the Logical Framework Analysis which is presented in the Revised Project Document for Phase V (see annex). This had been developed from a group exercise in Mongu, carried out towards the end of 1988. This matrix can, however, not be used to define the objectives of the earlier phase of the programme.

The matrix identifies 8 outputs, the most important of which are reviewed here. According to present operations, it is likely that close to the planned 1100 wellpoints will be constructed and operational by the end of 1993. However, less well documented is the considerable sum of money which has been spent to rehabilitate many of the 422 boreholes and shallow wells which were installed up until 1985. According to the latest population estimates drawn from the 1990 census, and based on average figures of accessibility to well points, it is estimated that the operational wellpoints reach 43 % of the rural population in the province. This figure could have been higher if there had not been such a high failure rate amongst the facilities constructed in the first years. Less clear is the nature of distribution between and within districts.

In addition to providing wellpoints, the programme has since 1988 incorporated a complementary project designed to upgrade traditional wells, in association with the Ministry of Health. Here it is estimated that a further 25 % of the rural population can be reached with improved water sources through much simpler and cheaper technological interventions. Assuming that 50 persons can have access to each such facility, then in the order of 2500 wells may require upgrading. Figures on the actual number of wells already improved through the project are not available, but is estimated to be in the order of 200.

Planning for future programme activity is difficult in the absence of more complete information. Whilst, the attainment of 43 % coverage is commendable, how well the coverage is distributed is questionable. Different geographical areas and settlement characteristics require different technological solutions. In those areas known as the plain edge, population density is relatively high and water is available close to the surface. Here, upgraded traditional wells or Blair pumps may have a major role to play. Within the forested areas, away from the Zambezi, surface water is scarce, and boreholes must be sunk to depths sometimes exceeding 100 meters. The team learned that within Kaoma district, there are 27 such deep boreholes which have not yet been attended to. It is understood that DWA is trying to build up an inventory on the status of all water points in the province. Such efforts must be encouraged, and must provide the basis for planning future operations, and for assessing performance.

The fact that there are no physical indicators to measure access to improved sanitation, demonstrates the programme's lack of concern for sanitation matters. While it can be argued that within scattered rural settlements, the construction of latrines is a lower priority, it is nevertheless not acceptable that in fifteen years, not a single initiative beside the educational work of the CEP team members has been taken to

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investigate ways to improve excreta disposal. This has undermined the overall impact of the rural programme.

The Matrix includes qualitative outputs defined as properly installed facilities, community capacity to maintain their facilities and DWA capacity to support the community. These issues are discussed in greater detail in the sections which follow. They are primarily a function of human resource development initiatives designed to achieve sustainability. They are clearly addressed by the programme through the activities of the CEP teams. At this point in time, it would be fair to say that the structure is in place to achieve a reasonable degree of sustainability. The major constraint to their being achieved sooner rather than later is capacity.

Behavioural indicators consider the extent of community acceptance of new facilities, their increased understanding of the benefits of improved hygiene practices, and their acceptance of a responsibility to maintain those facilities. Such objectives are not immediately attainable and are difficult to measure. Attainment will in large part be a function of support provided by the CEP teams. Measurement of attainment will require in-depth community based knowledge attitudes and practice surveys. However, the social impact of the programme is considered in greater detail below.

In summary, the programme today consists of functioning and effective hardware and software components. Appropriate technological solutions have been developed and handpump technology is being standardised. A clearly defined selection mechanism for participation in the programme has been developed which incorporates technical, social, geographical and logistic considerations. A planned delivery programme has been developed which incorporates the work of the CEP teams with that of the drilling teams. The importance of the software component is fully recognised and is afforded a high profile in the programme. There are good indications that community based management of facilities can be attained and that improvements in hygienic practices associated with water and sanitation will follow. The potential benefits of the programme could, however, have been enhanced if a sanitation component incorporating the construction of appropriate excreta-disposal facilities, had been developed.

5.2. Institutional and Organisational Issues

5.2.1. Introduction

As a consequence of the failures of the original rural water supply programme, and mindful of recommendations contained in the 1984 and 1987 evaluation reports, considerable effort has gone into developing an effective delivery system for rural water supply. At the time of writing, DWA's provincial office believes that it has established a workable and effective system which can yield desired results, based upon a combination of hardware and software components.

Of particular note are the linkages which have been established horizontally between different government departments and professional cadres, at provincial and district level, and of linkages established vertically between province, district and the community, in support of the overall objectives of the programme.

As a result, the concept of an integrated approach to water supply, sanitation and health education, has by and large been translated into a workable and operational system. Credit should be given here, to a task which more often than not only receives lip-service. This achievement has not been confined to the project area alone. It is understood that projects from other provinces have come to study the experience of Western Province while members of the programme's CEP teams have been invited to address seminars and workshops in other parts of the country.

Due to these achievements, the programme is able to provide services to rural communities which contain, technical, motivational and educational components. All indications are that the foundation has been laid to sustain programme objectives, in terms of maintenance of facilities, and improved water and sanitation hygiene behaviour.

5.2.2. Intersectoral Cooperation

Lessons learned from the first phase of the programme re-confirmed how vital community participation and education are to water supply and sanitation projects for rural communities. Experience gathered from around the world during the course of the Water Decade has demonstrated that trying to integrate engineering and social components of a programme is fraught with difficulties, associated with professional resistance to multisectoral approaches, lack of planning between sectoral inputs, and poor communication, coordination and feedback.

The Department of Water Affairs and its partners have come a long way to overcome such difficulties. Underlying this success has been the acceptance by Government of the need to establish the Water, Sanitation, Health Education (WASHE) committees at district and provincial levels, which have given credibility to the concept of intersectoral project planning and implementation. Representing a broad spectrum of Government departments (health, social and community development, agriculture, water etc.) and chaired at district level by the Council Secretary, and at provincial level by the Provincial Permanent Secretary, such committees are responsible for policy and planning pertaining to the programme, and provide legitimacy for intersectoral cooperation at the implementation level. Through this forum, issues concerning water supply and sanitation are not viewed as the sole responsibility of the client organisation, but as issues of common concern. As an outcome of this, the programme is popularly referred to as, " the WASHE programme. " This has been reinforced by the production of WASHE T-shirts and stickers which depict the three components of the programme; water, sanitation and health education.

The success of the integrated approach is revealed at the operational level where the CEP teams operate. While physically based in the premises of the DWA, and responsible to the DWA programme coordinator, the teams comprise officers with various skills, largely seconded from other Ministries. Examples include Nurses and Health Assistants from the Ministry of Health, extension workers from the Ministry of Agriculture and teachers from the Ministry of Education. Plumbers and bricklayers have in addition been directly recruited and trained by DWA to complete the CEP teams. The advantages of this kind of arrangement are several. Of note is the sharing of complementary skills necessary to conduct community education and participation. Further, the access that the CEP members obtain to other extension workers based in the community, which can provide outreach and facilitate coordination and communication. Through this approach, it is difficult to label the programme as a DWA project which can only draw assistance from DWA employees, and more as a Provincial project aiming at improving the conditions for the Province's population. The approach is effective in maximising use of scarce extension workers, while providing the opportunity for the project to serve as a catalyst for broader socio-economic development. In this sense, the concept of Primary Health Care is being implemented, whereby the responsibility for health-related activities is not confined to the trained health worker per se.

Within the programme's delivery system, the CEP's role is interwoven with the water engineering components; - the CEP teams preceding the drilling teams in order to mobilise communities, and providing follow-ups to deal with both hygiene education and facility maintenance matters.

There are also indications that the linkages between the DWA project teams and the Ministry of Health are considerable. Examples include the traditional wells upgrading component, whereby DWA utilises Health Assistants from the Rural Health Centres to implement the project, and whereby the two Ministries now plan together responsibility to share the component on a district by district basis, the handpump component whereby the CEP utilise the services of Health Assistants to first obtain access to



the communities, during their mobilisation campaigns, and their joint participation on WASHE committees. The Ministry of Health also utilises DWA's laboratory facilities to examine water quality from samples drawn from improved and un-improved sources.

There are, however, other areas where better use could be made of established linkages. In this respect, health statistics pertaining for example to the incidence of diarrhoeal diseases do not seem to be filtered into the programme, either as a criteria to assist planning, nor to support health education strategies for the CEP teams. The Control of Diarrhoeal Disease Programme could also utilise the CEP teams to more widely disseminate and collect information on treatment of diarrhoea and the use of O.R.T.

Regarding the improved traditional wells component, support provided by the CEP team is not so institutionalised as in the handpump component. Without under-valuing the positive contributions made by the Health Assistants assigned to these projects, the systematic and dynamic approach of the C.E.P. teams could provide a useful input in strengthening health education to communities where supplies, although improved, are still susceptible to contamination.

5.2.3. Institutional Capacity and Programme Sustainability

Notwithstanding the many achievements considered above, there are areas of concern which have a bearing on the future sustainability of the programme, and on the likelihood of achieving longer-term objectives. These above all concern the extent to which the programme can be integrated into the GRZ system.

Considerable efforts has been made to integrate the rural water supply programme into the established operations of the Department of Water Affairs.

At an institutional level, the post of programme coordinator has been assumed by their hydrogeologist at provincial level. The incumbent is responsible for overall programme management, and directly supervises the operations of the provincial CEP and drilling teams, and of their counterparts at district level.

At district level, the rural programme falls under the responsibility of the Officer-in-charge of Water Affairs. Presently, the rural programme must compete for attention with the township supply. In this respect, there is no separate coordinator of rural water supplies. Indeed, transport and premises as well as administrative staff are shared between township and rural water supplies. The only staff dedicated to the rural programme are the district CEP teams. However, this is the very team which is presently not recognised within the GRZ establishment - in this respect, the CEP team retains a project status. At the same time, it is the single most important element of the rural programme, and is a key to its future sustainability.

Communication between the district and provincial level is directed through the district officer-in-charge to the provincial hydrogeologist. Communication however exists between the district CEP and the provincial CEP team which provides supervision and training support. The provincial CEP team is again a non-established organisation, although most of its members are seconded from established posts in other line ministries. The implication is that the only officer at provincial and district level who has full time responsibility for rural water supply matters is the programme coordinator, aside from those seconded to the CEP teams. His post, although established, is particular to Western province, and is not necessarily to be found in other provinces. The coordinator supervises on the one hand the CEP team, and on the other hand, the drilling teams, who in a similar way to the CEP are dedicated to the rural programme.

The rural water supply coordinator (hydrogeologist) reports to the Provincial Water Engineer. However, of concern is the fact that the rural programme has no counterpart staff at the headquarter level. In



consequence, the set-up developed in the Province is project orientated, and to a degree autonomous from the overall structure of DWA. This raises several questions concerning the long term sustainability of a rural water supply programme, as regards policy formulation, planning and budgeting, establishment of standards, monitoring and evaluation, and even schemes of service.

An achievement is the localisation of all programme-related posts with the exception of the mechanical superintendent. Almost 90 posts held by trained artisans such as plumbers, mechanics, drillers and bricklayers who have been hired and trained by the programme, have not as yet been established. Their salaries continue to be drawn from the project. Without a large number of these posts, the programme is not sustainable, as they form the cornerstone of the delivery system, namely CEP, drilling, and workshop. It is of considerable importance that minimum staffing requirements are identified to match the future orientation of the programme (assuming some degree of scaled-down drilling and construction) so that GRZ can make arrangements to establish the necessary project posts.

In summary, the rural programme is supported by an effective delivery mechanism. The various elements which have developed out of the experience of the programme over the years are impressive and indispensable. However, for the time being, they very much retain their project status and have not been integrated into a standard DWA establishment structure.

A further area of doubt concerns logistic support. Programme effectiveness is influenced in large measure by the availability of transport. This applies as much to operation and maintenance as it does to implementation. Presently, all plant and equipment has been purchased through project funds. Capacity to develop boreholes depends on the number of drilling rigs and support vehicles available. While in the future, it can be assumed that the level of drilling activity will decline, a minimum capability will have to be retained. A portion of equipment presently operational will have to be replaced and maintained by non- project funds.

CEP activities are long-term and will continue to be required to support training of operators, provide back-up maintenance service and continue with health education activities. Their present capacity to perform their duties is constrained by lack of transport. Although the provincial team by and large have access to a vehicle at all times, at district level, the single vehicle available is shared between township and rural supplies. District CEP require a separate vehicle. That likelihood is questionable, particularly if the present fleet of vehicles must be replaced and maintained with GRZ funds.

Regarding the absence of a sanitation component in the rural programme, this can in part be explained by an absence of felt need at community level, which has therefore not prompted a major investment of time from authorities. It is also due in part to an absence of departmental interest to address sanitation issues. In this respect, the WASHE committees have failed to pay attention to sanitation matters, in spite of sanitation being an integral part of the WASHE concept. As a result, little has been done regarding the identification of solutions or methodologies to excreta-disposal issues, which could assist efforts made by CEP staff to encourage latrine construction.

5.3. Impact and Social Issues.

As already indicated in previous sections, initially, the Rural Water Supply programme was based on an engineering approach. This approach viewed water supply as a technical more than a social commodity. As a result the community was not involved in planning, implementation and maintenance of their own water sources nor were they consulted on selection of the technology used. Guided by crude population estimates the "experts" determined community water needs and constructed boreholes and shallow wells accordingly. Due to lack of communication and/or community involvement the programme met some resistance from the beneficiaries. Maintenance of water supply facilities was neglected. In some cases new facilities were abandoned and communities reverted to their traditional sources.

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After the 1984 evaluation the programme started to revise its approach. The CEP approach was adopted and is now an integral component of the rural water supply programme. The CEP approach views the water consumer as an active participant in the process of improving his/her water supply. Therefore, the CEP teams' role and input in the process of providing water supply to the villages is to ensure that the community is actively involved in all the steps of the process.

5.3.1. Major CEP Activities.

These are outlined below:

- * Health education and motivation on water and sanitation,
- * Training of communities in how to manage and maintain their handpumps,
- * Securing community participation in planning, implementation and maintenance.
- * community organisation through meetings, seminars, and workshops,
- * Informing and assisting communities in how to establish income generating ventures for operating and maintenance funds.
- * Training of other extension workers to carry out motivation activities,
- * Promotion of intersectoral collaboration,
- * Carrying out of water utilisation studies and other surveys to establish utility and sustainability of the supply and of behavioural changes,
- * Setting up monitoring and evaluation systems to determine the social impact of the programme,
- * Production of CEP materials,
- * School health education

5.3.2. Major Achievements.

The overall objective of the rural water supply programme is to improve the quality of life for people especially women and children. Therefore one task for this evaluation Team was to determine to what extent this objective has been met. Due to lack of baseline or systematic impact studies and/or controlled studies, the Team was not able to assess the impact of the programme in terms of health and socio-economic benefits, (i.e., time saved and utilisation of time saved). However, review of project documents, meetings with project personnel and in-depth discussions with selected consumers indicate that CEP activities have made some positive impact. Some of these programme achievements are outlined below:

i) Easy access to adequate and safe water provides several advantages:

- * improvements in water supply and water use are often accompanied by a decrease in water related diseases and increased quality of life.
- * time saved from walking long distances to and from traditional water supplies can be devoted to other health promoting activities such as personal hygiene, rest, income generating activities, while physical ailments resulting from the strain of fetching water can be minimised,
- * verbal reports from project personnel and selected users indicate that levels of awareness and knowledge about the importance of safe water i.e., the link between water and health among the rural population is increasing. Further, the increased demand for improved water supply from the community underscores the point. This positive attitudinised change could be attributed to CEP motivation and follow-up activities through-out the province,
- * Awareness of the general benefit of easy access to safe water can be seen as the largest benefit in itself.

ii) The approach adopted by the CEP component of the programme is consistent with the official Zambian policy outlined in the National document of 1991 which emphasises the PHC concept. The PHC approach stresses active community participation, intersectoral co-operation, coordination

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of resources between all sectors/institutions and development of community capacities to manage their own water affairs.

- iii) In line with the current government policy which emphasises cost-sharing in the provision of social services, the CEP component recognised the importance of cost sharing and recovery measures long before the GRZ announced its departure from the policy of free social services to cost recovery policy in 1992. Each village or defined community with a water facility provided through the programme has or will have established a Village Maintenance Team responsible for pump maintenance (cleaning facility surroundings, general routine checks and minor repairs of the pumps). The community also provides available local building materials (sand, stones, gravel and fencing) at the construction site and provides labour in construction. Since maintenance requires money, the CEP has motivated and assisted communities to develop systems to generate money for maintenance. As a result, communities have in instances organised themselves to raise money through monthly household contributions and income generating activities such as growing vegetables and fruit (oranges, bananas, cashew nuts). And although not well developed, some villages have even formed small co-operatives selling essential commodities like salt and mealie meal.

Even though community contributions may be insignificant in monetary terms, the principle of cost sharing has a significant effect. It fosters a sense of ownership and responsibility among the people who use the facility and promotes project sustainability. Evidence from other projects and even from the project under review prior to 1984 indicate that free services are often not necessarily valued by individuals or communities. Such services are often neglected and even abandoned as no commitment from the users is attached.

- IV) To strengthen community capacities to manage their water facilities the project has embarked on a comprehensive training programme for Village Maintenance teams and other extension workers.
- v) Over 50% of the CEP teams consist of women. Most significant is that some of the women on the project have been trained and employed in technical jobs like plumbing, bricklaying, and metal work. This approach breaks the stereotype of role segregation by sex and sets a good example in the community that women can be employed and do well in fields once considered men's domain. There is also evidence that men in the villages are challenged by seeing female artisans.
- vi) The Village Water Committee (VWC) membership consists of at least 50% women. Participation of women in VWCs offer women an opportunity to participate in planning and decision-making of their water needs. CEP personnel report that exposure and experience gained from water projects has assisted women to develop skills and self confidence to negotiate their water needs openly with men and meet and talk to strangers of either sex. These experiences were reaffirmed during in-depth discussions with users carried out by this Team. Women were observed negotiating water responsibilities with men (who does what, why, and why not?) very assertively. An extract from the dialogue illustrates the point:
- CEP member: produces a black and white poster from her folder showing a dog licking some dishes,
 - CEP member: whose fault is it that the dog is licking these dishes?
 - A male participant: it is the fault of a lazy woman who did not wash the dishes after lunch; she went away to sleep,
 - A female participant: no! it is the fault of a lazy man who did not build a dish rack so that a woman could put the dishes away from the dogs,
 - A male participant: but building a dish rack is not difficult, all is needed is to cut small sticks; even a boy or girl can manage, after all women do harder things than that,
 - CEP member: but why can't men do dishes?
 - A male participant: if men do dishes, what is the point of having a wife?
 - A female participant: thank you, why should women build dish racks when they are married; what

- will husbands do?
- All participants: laugh loudlydialogue continues.....

It is hoped that knowledge and skills learned from this project can be extended to other areas of women's lives i.e negotiating for safer sex against AIDS and unwanted pregnancies and other national development issues. Further, these forums provide an opportunity for both men and women to become more aware and sensitive about each other's needs and problems. For example men will become more aware of women's burden due to multiple responsibilities (as wives, mothers and formal or informal wage earners) and ultimately a process whereby men and women will work together as a supportive team may begin to unfold.

5.3.3. Constraints

- i) Although most indications seem to suggest that CEP is making a positive impact it is not possible to quantify the social and health benefits of the programme. Very little has been written and reported about the positive and/or negative experiences gained by the CEP teams in this programme or how the procedures/materials are being used. Lack of such documentation undermines the programme's efforts and outcomes. For example, routine data on utilisation of improved water supplies and general hygiene and sanitation is collected before and after installation. However, due to excessive work load resulting especially from recent drought-related activities and lack of capacity and skills in data analysis and presentation of findings, this data-base has not been tabulated nor analysed. Therefore, assessment of the impact of the programme in the absence of data indicating utilisation patterns and behavioural changes is difficult.
- ii) The present CEP teams' capacity (both human and materials) is limited. Currently the CEP teams cannot cope with the community expectations and demands that the programme has created. Training needs for Village Maintenance teams and extension workers to carry out motivational activities cannot be met, development of training materials is also wanting and routine activities (i.e., out reach activities such as assessment of community water needs, follow up visits and data management) are lagging behind.
- iii) The training and health education component in the micro- project is weak. The programme does not train the community in how to improve their traditional water wells. At present the community provides free labour but "skilled work" is done by Health Assistants. Withholding of technical knowledge from the community will result in the community's failure to make decisions to improve their water supply and act upon it. The technology involved is quite simple and with a minimum skills training, any local builder can go out and improve the traditional wells with little external support.

5.4. Technology

5.4.1 Handpumps.

In general handpumps are used where:

- a. The source is a borehole or a tube-well with a diameter too small for a bucket.
- b. The number of users of a well are so high that a bucket and windlass is not feasible (long waiting queues).
- c. The well is too deep to make buckets feasible.
- d. The pump prevents pollution of the water source.

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In the rural water supply programme in Western Province the use of handpumps is mainly determined by alternative a.

Handpumps are fairly simple devices. Most of those found in the developing world are constructed on two technical principles:

1. A pump cylinder is mounted on the bottom end of a pipe submersed into water (rising main) with a piston connected to a pump rod inside the pipe leading up to the pump handle at the surface (piston pump).
2. A pump-house with a rotating impeller at the bottom end of the rising main in the well and a rotating pump rod (shaft) to a moving device at the surface (centrifugal or eccentric pump).

Although the principles are fairly simple, a large variety of makes and models of handpumps exist. The main concern regarding the handpumps are that a relative high number on the market are not made for intensive public use as is the case in rural areas in developing countries. The need for a strong pump with simple maintenance routines and spareparts that can be afforded has been underestimated when selection of a pump is made.

In a water supply programme where handpumps are to be used it is normal to try to rely on one or a small number of types, however, the rationale for selecting a particular type can be based on various concepts. It may either be a national policy of standardisation, particularly if a model is made locally, it may be based on a world wide survey (WHO-survey), a type known to the decision-maker or on skilled marketing by a certain manufacturer. Among technicians, one often finds strong views on pros. and cons. for the various different types. In donor funded projects, there has also often been a tendency to choose pumps manufactured in the donor country.

As Zambia has still no national policy on standardisation of handpumps, the result is a situation where almost any kind of handpump can be found somewhere in the country.

This lack of standardisation has also affected the programme in Western Province. Up until 1987-88, different makes of handpumps were introduced to the programme. The rationale for having selected the different types has not been revealed by the Team as no documentation on why a certain make was introduced has been obtained. It is, however, suspected that reasons may have been:

- lack of continuity in the management.
- personal preferences by project personnel at different times.
- limited knowledge of maintenance consequences.
- availability on the market etc.

Added to the types already installed in the province prior to the programme and some models introduced by NGOs without consultation with local authorities, there are at least twelve different makes of handpump existing in the province, though not all of them are in use at present.

To maintain a water supply programme with this variety of models, the province has been faced with two alternatives. Either to:

- i) keep a variety of spares for all different makes and models or,
- ii) standardise on a limited number of models and replace completely all other models.

Alternative i) requires a wide variety of spareparts to be in stock resulting in:

- considerable funds being "locked " in stocking spareparts
- low turnover of a wide variety of spares
- complicated routines for sparepart procurement from various suppliers

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- reduced opportunities for bulk procurement
- O&M personnel to be trained on maintenance and repair of different models with the risk of "mixing up everything".

Under alternative ii) the following consequences arise:

- funds which could have been used for new installations will be spent on replacement of redundant models.
- repairable pumps end up on the scrapyard
- less funds are needed for stocking spareparts and therefore more funds are freed for other activities
- more emphasis needs to be placed on improving maintenance skills
- new stock and spares can be provided by bulk procurement and therefore at reduced prices
- spareparts can more easily be made available in local shops

In 1988-89 the Province to some extent decided to opt for Alternative ii) and chose to standardise on two pumps, the India Mark II and the Blair pump, but to keep the Consallen pump in one district where a majority of this type existed already. The India Mark II is marketed world wide and recognised as a pump which is relatively simple to maintain. The Blair pump is very simple and has become a popular pump for shallow water sources in this part of Africa. The pump differs from the two principles mentioned above by having a simple technique whereby the rising main and the bottom valve are the only moving parts of the pump. The pump is presently being manufactured in Zimbabwe but because of its simple construction, it could in principle be manufactured anywhere.

Since none of the selected pump models are manufactured locally the project still uses foreign currency to procure new pumps and/or spareparts. However, the pumps can be procured in Zambia although at a higher price. The pumps available in Zambia are, however, also imported. It is therefore more a question of policy whether the pumps are imported by a local company or by the Province itself as all procurements are based on international tenders.

A consequence of "standardisation" has been that as other pump types need major repair they will gradually be replaced by an India or Blair pump. The Team has not been able to get statistics on how many old handpumps have been replaced due to mechanical breakdown, or due to collapsed wells and boreholes because a substantial part of the water supply points from the first phases of the programme have been replaced. It has, however, become evident that a considerable part of the investments made in the first phases of the programme has been "lost" due to choice of technology.

It should be appreciated that standardisation was introduced in time to avoid even more varieties of handpumps being introduced to the Province. In terms of sustainability the standard pumps used are imported and the Province remains and will continue to remain dependent on foreign currency until the Kwacha is convertible. To maintain sustainability some assistance from the donor will still be required.

In this respect there are two areas of cost recovery that should be assessed:

- i) Scrutinising the possibility of refurbishing "scrapped" pumps, either for sale if some of these types still are used in other provinces, or to use some of these pumps in the squatter settlements in the townships. Use of boreholes and handpumps in these settlements instead of expanding the reticulation system will defer the need to increase the capacity of township distribution systems. The township settlements are closer to local hardware shops that could market necessary spares. The issue of introducing boreholes and handpumps in the squatter settlements has been described in chapter 4.
- ii) At present the rural population has to go to Water Affairs in the district or province to buy spares. As the people themselves get more confidence in diagnosing and repairing their handpumps, spares



should be made available in local shops. A pilot project on how to establish a credit scheme and a revolving fund for supply of spares to local shops should be investigated.

5.4.2. Boreholes

Drilling of boreholes was introduced in the programme in the mid 1980s and was a consequence of the experience of the rapid collapsing of dug wells and poor performance of the jetting technique. The first drilling rig brought into the programme (a percussion rig) also had problems in the collapsible Kalahari sands that cover a relatively high proportion of the province. Most likely, a considerable amount of money has been lost due to personnel unfamiliar with the geological conditions and to equipment not particularly suited to these conditions. It can therefore be argued that more emphasis should have been put into clarifying the conditions for the provision of primary water supplies like shallow and deep wells, jetted wells, boreholes etc. and the hydrogeological conditions where the different alternatives are viable. In addition to the "alien" geological conditions, the groundwater in Western Province is surprisingly acidic. Corrosion of steel materials like borehole casings, steel screens, pumps and rising mains amounts to millions lost in the project, mistrust in the water supplies in general and to the need for strict maintenance routines to avoid complete breakdown. To contravene this problem, the introduction of stainless steel, PVC pipes and the use of corrosion resistant materials may be required but will result in higher material costs than would otherwise have been the case.

In complicated geological conditions, correctly constructed boreholes are the best way of extracting groundwater. They are also the safest way of providing uncontaminated water. However, construction of boreholes is a skill not easily learned, a conclusion reached in this project where insufficient effort was originally put into clarifying the best way to construct boreholes.

Still no systematic description or manual for construction of the different borehole types exists, though the programme personnel, from experience, have a reasonably good idea of how to do the job. At present the boreholes are constructed more on "local tradition" gained from experience than from design criteria. It is, however, the hope (but only a hope) that the constructed boreholes will stand a lifetime of more than 10-15 years.

5.4.3. Jetted wells.

Jetting of wells in alluviums and/or deposits is an old technique that has been modernised. Jetting was obviously introduced at a relatively early stage of the programme's development but either the equipment was not suitable, the technique not adequately familiar to the personnel or the process of jetting was not professionally performed. As for many other aspects of the project's history not revealed due to lack of a project "logbook," the Team was not able to disclose which factors participated to the relatively high proportion of jetted wells that later have had to be abandoned. What has been documented is that the project in the earlier phases did not use the high pressure method presently used. The jetting technique developed and the personnel trained in the project now seem to have reached a stage of reasonable perfection. In many cases now, the jetting itself is carried out in a few minutes. The Team was not able to see the jetting equipment in operation but have had discussions with the project staff on the equipment and technique used. Whenever possible jetting is a reasonably cheap way of "drilling boreholes" and will normally in sandy conditions give less problems than dug wells provided the aquifer yield is enough to feed a handpump. The jetted wells in the project seem normally not to exceed 6-7 meters and are fitted with Blair pumps. Compared to boreholes and even dug wells, jetted wells are reasonably cheap and should continue to be developed wherever feasible.

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5.4.4. Shallow wells.

Shallow wells were introduced to the project at an early stage. However, the geological conditions of the area are not particularly favourable for dug wells below a perennial water table. Even if a limited number of the dug wells in the project go as deep as 8-10 meters, the majority of the wells are only a few meters deep. Collapsible soil conditions and particularly the "boiling" sand which occurs when the well goes below the water table, contribute to the need for skilled workmanship in maintaining a well as a long lasting facility. At present dug wells are gradually being phased out as an alternative to boreholes or jetted wells.

5.4.5. Improved traditional wells.

Living close to the Zambezi or its tributaries, on or near the Zambezi plain, access to water has never been a major constraint to the majority of the population in Western Province. A relatively high proportion of the population still draw water from rivers or from traditional dug wells. In 1988 upgrading of traditional wells was introduced into the project. This particular project has been named the Microproject. So far upgrading of traditional wells has been the responsibility of Health Assistants in the districts.

The Microproject provides people with considerably better water quality than the traditional open wells for a minimal sum of money. Being without any technical installations like handpumps or windlasses, the upgraded wells are especially sustainable as they require almost no technical know-how on the part of the user. The construction technique is easily learnt and health related improvements almost as good as any other improved water supply. With a limited input of "software" this project could have a snowballing effect.

However, a weakness of the project is that it has not aimed at training the local artisans (such as builders) in how to upgrade a traditional well to an improved standard. Instead it has been the project concept that the Health Assistants themselves carry out the "skilled workmanship" with some assistance from the local people. This project concept should be changed to one where the people themselves can build their own improved well with some assistance from a local builder in the village. It is therefore recommended that the Health Assistants together with the CEP team who have experience in community and artisan training, concentrate on training as many local builders as possible. A concept of this kind should be introduced sooner rather than later.

5.4.6. Conclusions.

It can be said that on the technological side the rural water supply programme in Western Province has gone through most of the problems related to introducing new techniques into a new environment. Some of the lessons learnt have been repeated from one "batch" of project personnel to another. Looking back it should be admitted that for a long period neither DWA nor NORAD seems to have been particularly professional in addressing to the technical problems related to the programme in Western Province. On the Zambian side this has now changed remarkably. The province has a professional and dedicated staff, the provincial staff feels that they get better backing from DWA. The major concern at the moment seems to be the uncertainty over future donor assistance.

The technology developed in the programme can be sustained with some modifications. On the implementation side the programme has passed its peak activity and is now in the process of establishing a steady continuous activity. The statistics of the programme have not been properly established. It is therefore difficult in such a short time to assess the correct level of activity but from the information collected and the Team's experience the present level of activity in the Rural programme is still too high to be sustainable without external support. A project activity plan aimed at bringing the activities down to a sustainable level is required.



Chapter 6

CONCLUSIONS AND RECOMMENDATIONS

6.1. The Township Water Supplies

6.1.1. Mongu and Limulunga Townships

Design and Present Status

Conclusions

Mongu District Council is so far the only Council in the province which has taken over responsibility for running their township water supplies. The Council now operates the water supplies in Mongu and Limulunga through the semi-autonomous Mongu Water Works, while DWA operates the Namushakende supply.

Mongu township water supply was augmented in 1983 to 45000 people. It was again upgraded in 1987 to serve a population of 96000 people in 1995. This projection seems not to have been too far from what can now be expected.

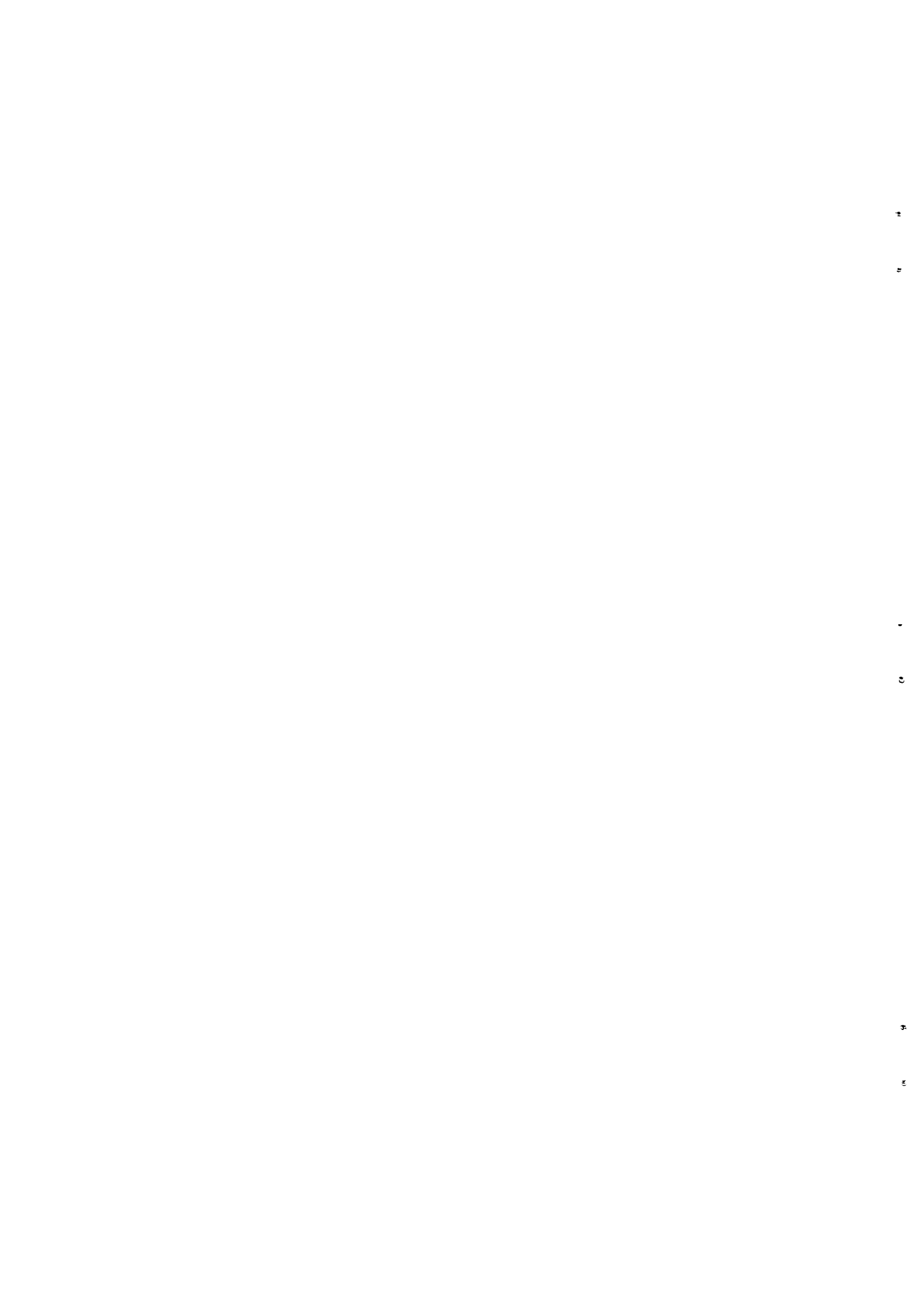
Both townships have operational reticulated water supplies. However, the state of repair of these water supplies can be described as follows:

- * Limulunga has insufficient water due to corroded rising mains in several boreholes.
- * Mongu has water shortages in some areas mainly due to leakages.

Recommendations

As the water supply system in Mongu now serves a population close to the design population, it is recommended that NORAD should not provide funds for any further extension of the reticulation to unserved areas, unless it is also prepared to fund a new expansion of the water supply.

It is, however, recommended that NORAD should fund the remaining work to increase the capacity to the designed 144 litres per second. The funding should be kept within the remaining estimate of NOK 7,5 million plus escalated cost from 1989 to 1993. A revision of the 1989 design should be made.



Organisation and Institutional Matters

Conclusions

Defining sustainability as the ability to operate and maintain an installation without external support, Mongu Water Works at present must be regarded as **not** yet sustainable.

However, at present indications are that Mongu Water Works, will in the future, on certain conditions, be able to manage and maintain the water supply systems in the two townships. One of the main conditions is that it will be given the opportunity to operate on a commercial basis.

As a result of the conditions set out by NORAD in 1990, for further funding, there has been one major achievement and one set-back:

- * The achievement is that the Mongu Water Works now is a semi-autonomous body with its own management and its own account.
- * The set-back is that the Council has not covered the deficit between O&M expenses and revenue income.

Efforts are being made to increase revenue. Progress is lagging behind that of the townships, but it is understood that the introduction of water meters, improvements to the distribution network at the Hilltop, and revised tariffs will result in recovery rising from a present 50 % to 60 % in 1993.

However, whereas DWA has committed itself to absorb the township's salary costs for the next two years, as a means of assisting the township supplies, Mongu District Council shoulders full responsibility on the water department to meet its recurrent costs. This is an unrealistic proposition, and is only presently sustained through NORAD intervention.

Recommendations

To fully establish Council ownership of the water supply systems, and to reduce NORAD's support for O&M, a phasing out period of three years is suggested. In this period, the deficit between expenses and income should be reduced to almost zero. It is recommended that the support from outside starts in 1993 with a cost sharing of 75/25 % from NORAD and Mongu District Council respectively, and ends with a 25/75 % share of costs in 1995.

Mongu Water Works should implement the following remedies to curb water loss and increase revenue income:

1. Water meters should be installed at every GRZ, Council and commercial institution.
2. The old distribution system at the Hilltop should be redesigned and rehabilitated.
3. Total separation of pressure zones should be implemented.
4. Close monitoring of water consumption in different areas before and after the different actions are introduced, should be undertaken.
5. An action plan detailing the implementation of these activities should be prepared.



6.1.2. The DWA Townships

Design and Present Status

Conclusions

All the six townships have operational reticulated water supplies. The state of repair of these water supplies can be described as follows:

- * Kaoma and Lukulu have occasional water shortages due to insufficient electricity supply (thermal power).
- * There are no major problems reported from the remaining four townships.

The present flat rate water tariffs do not accurately reflect the different consumption patterns between the consumer groups. By installing water meters it has been revealed that Commercial, Institutional and High/Medium cost house consumers, have up to recently only paid for a fraction of the water they have consumed. The income potential for the Water Department will be drawn primarily from these consumers.

Figures from the 1991 census suggest that supplies will retain adequate capacity to meet demand until the turn of the century, provided actions are taken to curb water losses, and to control the expansion of the reticulation network.

Recommendations

It is recommended that NORAD should not fund projects which aim to extend the service area within the townships, as such future expansion work should become the responsibility of DWA, which now has limited design capacity, and should be able to finance such work on a commercial basis.

Organisational and Institutional Matters

Conclusions

GRZ has taken several important initiatives to address their policy of achieving full cost recovery on the operation and maintenance of the township water supplies. This includes, introduction of water meters, 6 monthly increase in tariffs, improvement in revenue collection efficiency, and a commitment to allow the Province to retain collected revenue as a revolving fund, to begin in 1993.

DWA is confident that revenues can be increased progressively to a point where full cost recovery can be met by 1995/1996. Further GRZ has undertaken to pay all salaries for 1993 and 1994, in order to allow the province to build up their revenues.

It will be necessary to review stand-pipe users' ability and willingness to pay. It may well be that full cost recovery cannot be obtained from these consumers. Further, there is evidence that GRZ institutions are often slow payers and have had a tendency to default, which further exacerbates low revenue, and sets a bad example to the rest of the community.

The replacement of worn out machinery is an integral part of operation and maintenance. The problem for the Water Departments is that such replacements require FOREX and sufficient income



to pay for the expenses related to the investment. It is not foreseen that the townships will be able to retain enough revenue to cater for major overhaul before 1995-96.

Improved services to institutions and high cost housing areas can be profitable, but expanded services to areas where the ability to pay is limited will result in a relatively high proportion of revenue income having to be spent on cross-subsidising, instead of providing increased income.

Community involvement in the operation and maintenance of township water supplies is limited. However, communal stand-pipe users are expected to maintain their facilities and to pay for water consumed. Accordingly, water committees have been created. Generally, support from DWA to these committees is modest, as compared to the kind of support built into the rural programme, but has improved through the Sanitation I pilot project.

Recommendations

It is recommended that NORAD continues to provide funds to support the replacement of parts which require FOREX, at least until 1995/6. Such support can be phased out as DWA approaches full cost recovery and GRZ is able to secure FOREX.

Social Impact

Conclusions

The Sanitation I pilot project has been instituted to provide more solid standposts, better taps, better conditions around the communal stand-pipes (slab, spillway and soak-away) and to install communal water committees at each standpost. Indications are that the project with relatively little money has managed to introduce a better understanding of what communal ownership implies, better understanding of the benefit of clean and easily accessible water and the consequences of misuse. The exercise, in addition, has contributed to curb water loss.

Recommendations

It is recommended that NORAD fund the continuation of the Sanitation I project so that it can be replicated to all townships in the province.

It is recommended that the CEP input to the townships is reinforced to ensure hygienic collection and use of stand-pipe water, and to provide support to water committees. This can best be achieved through the Sanitation I pilot project.

Technology

Conclusions

In low-income peri-urban areas where settlement is primarily informal, alternative ways of providing water supply by means of boreholes and handpumps (as in the rural areas) should be considered. With the experience and the impressive results gained in the rural water supply programme the CEPs will most likely be able to promote a similar development in low cost water and sanitation in the townships, where the option of providing stand-pipe water may prove to be too costly both to GRZ and to the consumer.

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Recommendations

It is recommended that NORAD should fund and encourage a pilot project of this kind within the context of the programme. It should aim at determining the feasibility of alternatives to supply from communal standposts.

6.2. Rural Water Supplies

Design and Present Status

Conclusions

The Rural Water Supply Programme as it stands today has recorded significant achievements in terms of developing a sustainable rural water supply system. This includes initiatives to, standardise technology, refine drilling techniques, involve user participation in operation and maintenance, and incorporate health education.

By comparison, the initial programme, implemented until 1985 must be viewed as an almost complete failure.

By the end of phase V (1993), it is probable that the target of constructing 1062 operational wellpoints will have been achieved, serving an estimated 43 % of the rural population in the province.

However, there remain communities which have met the selection criteria, but which will not have been served. Furthermore, the programme has identified several hundred additional communities which could be served if the selection criteria were modified.

The Microproject offers a cheap and sustainable option for upgrading water supplies where water is close to the surface. It is estimated that a further 25 % of the rural population can be served by means of this project, leaving only 25 % which may not be served through government-supported programmes.

DWA is trying to build up an inventory on the status of all water points in the province. This is being carried out in recognition of poor record keeping in the past, and of the virtual absence of any formal monitoring system. The absence of accurate data has made the task of determining actual coverage and outstanding needs especially difficult.

There are good indications that community-based management of facilities through the Village Maintenance teams can be attained and that improvements in hygienic practices associated with water and sanitation will follow. The potential benefits of the programme could, however, have been enhanced if a sanitation component incorporating the construction of appropriate excreta- disposal facilities, had been developed.

From the information collected and the Team's experience, the present level of activity in the rural programme is still too high to be sustainable without external support. However, it is clear that the peak level of implementation has passed and the programme will progressively focus on the maintenance and rehabilitation of installed supplies.

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Recommendations

It is recommended that NORAD fund the construction of additional boreholes and handpumps based upon an appraisal of outstanding workload, and rig capacity. Any further work should be approved by the WASHE committees. This refers specifically to determining the justification for modifying selection criteria, and for determining levels of coverage between, and within districts.

A project activity plan should be prepared by the province to take account of outstanding workload. This can only be developed once a comprehensive inventory of present status has been produced, and this will serve as a basis for determining the level of future NORAD support.

Whilst the drilling programme continues, NORAD and DWA are urged to identify ways of reducing the FOREX component of the programme, in anticipation of the future handover of responsibility of the programme to GRZ sustain coverage at the 50 % level.

The use of the heavy drilling rig (HY 76) should be phased out over the next 2-3 years. Since all the outstanding work for this rig will have been completed, there will be no need to replace it. There will, however, still be need for the lighter drilling rig (HY 79) in the programme, which NORAD should continue to support.

However, jetting of tube-wells has been proven to be an appropriate technology in the alluviums on the plain, and should be used as a first option.

Hand dug wells have not been successful in Western Province. There is no need for further involvement in this field.

NORAD should continue to fund the upgrading of traditional wells (micro project). However, the present concept of using Health Assistants as artisans while they have plenty of other responsibilities to attend to is not advisable. It is recommended that the CEP teams who have developed skills in community and artisan training should be more involved in training of local builders in the skills of improving the traditional wells.

Institutional And Organisational Issues

Conclusions

Experience from the rural water supply programme has demonstrated that in order to achieve sustainability, a high input of software is required. Without the CEP component, there is little chance that technical input alone can yield sustainable results.

The concept of an integrated approach to water supply, sanitation and health education, has by and large been translated into a workable and operational system. This can be seen at policy level in the WASHE committees, and at implementation level, in the CEP teams.

Projects from other provinces have come to study the experience of Western Province while members of the programme's CEP teams have been invited to address seminars and workshops in other parts of the country.

The CEP teams are, however, not recognised within the GRZ establishment - in this respect, the CEP teams retain a project status. At the same time, it is the single most important element of the rural programme.



The provincial hydrogeologist is the only officer at provincial and district level who is fully assigned to the rural water supply programme as the programme coordinator. His post, although established, is particular to Western province, and is not necessarily found in other provinces.

Of concern is that the rural water sector has no counterpart staff at the national level. In consequence, the set-up developed in the Province is project orientated, and to a degree autonomous from the overall structure of DWA. This raises several questions concerning the long term sustainability of a rural water supply programme, as regards policy formulation, planning and budgeting, establishment of standards, monitoring and evaluation, and even schemes of service.

Whilst there is good reason to believe that community management of handpumps can be achieved, there is little chance that the costs of initial installation, periodic rehabilitation, and of institutional maintenance and educational support can be recovered. An element of subsidy is inevitable, presently provided by the donor. Since there is no clear policy on cost recovery for rural water supplies, one must question how far GRZ is able and willing to subsidise the sector in the future.

There are almost 90 posts held by trained artisans such as plumbers, mechanics, drillers and bricklayers who have been hired and trained by the programme, and who for the time being hold non-established posts. Their salaries continue to be drawn from the project. Without a large number of these posts, the programme is not sustainable, as they form the cornerstone of the delivery system, namely CEP, drilling, and workshop.

Recommendations

It is recommended that the Province prepare an agenda for scaling down staffing requirements to match future operational levels.

From 1994, NORAD support of operation and maintenance costs should be phased out over a four year period. However, NORAD should provide FOREX to facilitate the purchase of spare parts until local manufacturers and suppliers have been identified.

GRZ must develop a national policy for rural water supply, as the need for subsidy is an inevitable one. Policy directives and strategic options will become necessary particularly once donor funds have been withdrawn.

NORAD should provide funds to support the various software activities carried out by the CEP, such as workshops and material development. GRZ on the other hand must commit itself to continuing support of the CEP concept and by absorbing those team members, who are presently paid for by the project, into the GRZ establishment, and commit itself to paying salaries.

Social Impact

Conclusions

The effectiveness of community management and maintenance of rural water supplies is a function of the training and educational input provided by the CEP teams.

The CEP teams are the focal point of hygiene education, and have established a link to sanitation. This input is most important in terms of allowing the project a chance to achieve environmental health benefits. However, this task has been constrained by the absence of a latrine construction component.



The CEP approach is effective in maximising use of scarce extension workers, while providing the opportunity for the project to serve as a catalyst for broader socio-economic development within communities.

Over 50% of the CEP teams consist of women. Most significant is that some of the women on the project have been trained and employed in technical jobs such as plumbing, bricklaying, and metal work.

The Village Water Committee (VWC) membership consists of at least 50% women. Participation of women in VWCs offer women an opportunity to participate in planning and decision making of their water needs. CEP personnel report that exposure and experience gained from water projects has assisted women to develop skills and self confidence to negotiate their water needs openly.

Knowledge and skills learned from this project can be extended to other areas of women's lives i.e negotiating for safer sex against AIDS and unwanted pregnancies and other national development issues.

The present CEP teams' capacity (both human and materials) is however limited. Currently the CEP teams cannot cope with the community expectations and demands that the programme has created. The district-based CEP teams are relatively weak, and continue to rely on the provincial team for support.

The impact of the programme in terms of access, affordability, modified hygiene behaviour, is difficult to determine due to the absence of baseline information, and periodic socio-cultural evaluation.

Recommendations

More systematic monitoring and evaluation studies are needed. There is also a need to conduct impact studies and to process and publish the available data. This should cover such areas as health impact, women's participation, knowledge, attitudes and practices, and affordability.

Further, the achievements of the CEP approach have been under-publicised. There is a need to document their experiences (possibly by making a video).

The CEP methodology should be fully incorporated into the Microproject.

A training of trainers approach should be used to enhance the capacity of the district-based CEP teams, so that they need not rely so heavily on the provincial team.

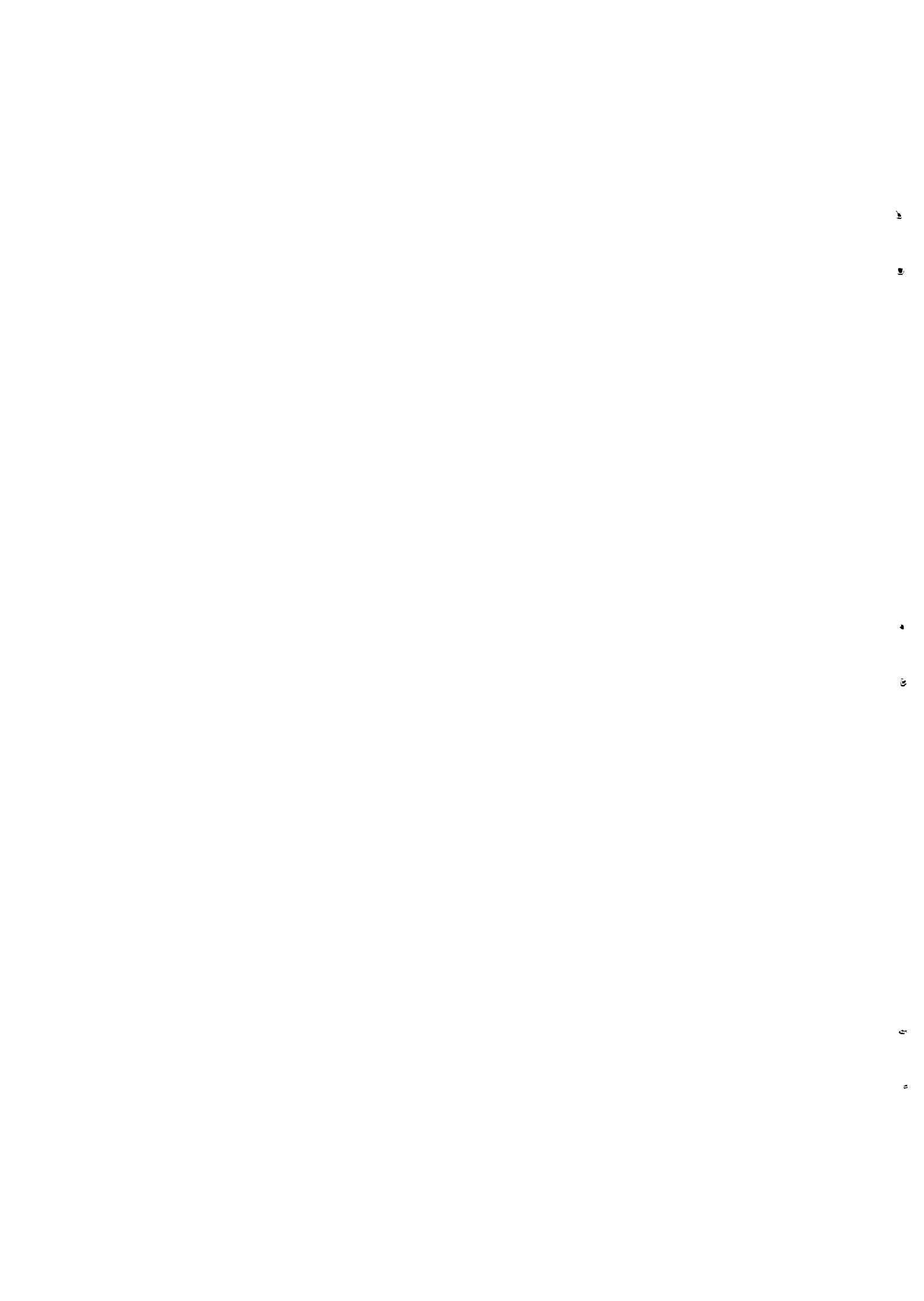
It is recommended that NORAD fund these suggested 'software' activities.

Technology

Conclusions

So long as handpumps used in the programme are imported, sustainability will be difficult to achieve. The Province remains and will continue to remain dependent on foreign currency. To maintain sustainability some assistance from the donor may be required.

Spare parts for handpumps are not easily available to scattered rural communities. Presently, spares are kept by DWA, primarily in Mongu, with only limited stock distributed to the district offices.



Recommendations

As communities get more confidence in diagnosing and repairing the handpumps, spares should be made available in the local shops. A pilot project on how to establish a credit scheme and a revolving fund for supply of spares to the local shops should be investigated.

Proceeds from the sale of spare parts may during this time be used to subsidise the cost of more expensive components which presently, communities are unable to afford.

6.3. Sanitation

Conclusions

A draft feasibility study into upgrading of sewerage and sanitation installations in Mongu was carried out in 1979. To date no action has been taken. More generally, the sanitation sector has hardly figured in the 15 year history of the programme.

It is only in recent years that the Ministry of Health has assumed charge of the pilot low cost sanitation project in Mongu. Remedial action regarding sewerage installations are long over due. There is no evidence of any form of participation by the Ministry of Public Works and Supply.

The pilot Sanitation II project, has paid insufficient attention to social, cultural and economic factors which will govern the success of the programme. Baseline data has not been obtained, while an opportunity has been missed to learn of the experiences of community sanitation projects from other neighbouring countries.

The project implementers of the Sanitation II pilot project have not solicited, or have not received the level of technical support that is demanded of a pilot project.

Techniques and materials developed by the CEP teams could be usefully applied to this project, and advantage could be gained of linking the project to the Sanitation I pilot project.

The team was impressed by the level of commitment given by the coordinators of the project, and there are indications, that they are receiving satisfactory support from the community. The project has set itself the ambitious task of calling on the community to share a family latrine between six households. It is nevertheless premature to assess the degree of acceptance and sustainability that this approach is likely to enjoy.

Considerable research and development is required before a sustainable latrine can be said to have been found. There are fundamental flaws with the present design, which are both technical and economic in nature.

Recommendations

It is imperative that the WASHE committees ensure that the Ministry of Works and Supply is brought into a committee structure so that a plan of action can be made to attend to all outstanding remedial sewerage work. More generally, the WASHE committees must be encouraged to plan and coordinate water supply and sanitation activities.

It is recommended that the coordinators of the pilot sanitation project commission a baseline knowledge, attitudes and practice study, to provide baseline data and assist in the formulation of an effective strategy.

It is recommended that a pilot rural sanitation project is incorporated into the rural water supply programme, in order to assess the feasibility of promoting rural sanitation. This would include a technology and a sociological component. Due care will need to be taken to ensure capacity to implement the pilot project. Based upon the results of the pilot phase, further assistance can be considered. NORAD should fund the pilot project.

It is strongly recommended that examples of low cost rural sanitation programmes in other parts of the continent are reviewed. In this respect, recent developments in low cost technology in Malawi, and Tanzania should serve as appropriate models.

The pilot programme should also address on-site sanitation requirements within the townships. The present pilot project in Mongu needs to be overhauled. NORAD should not provide further support to this pilot project until a more comprehensive and properly planned low cost sanitation pilot project for the whole province is formulated.

6.4. The Water Sector

Conclusions

It should be a matter of concern in the present discussions on decentralising the responsibility for the urban water supplies to the District Councils that support and coordination from the line ministry will be needed. If and when the responsibility for the water supplies are handed over, the risk is that the small number of professionals engaged in the water sector in the provinces will be spread even more thinly in the districts. There is therefore a need for recruitment and training of personnel in water management and O & M in the districts.

Rural and peri-urban water supplies may receive insufficient attention from GRZ and the councils in a decentralised set-up.

Up till now the WASHE committees have been primarily occupied with distribution of water supply services to the rural areas. In the future, it is foreseen that the WASHE committees will have more of a coordinating role for the water supply and sanitation sector, in general.

Recommendations

If the WASHE concept is to be introduced in other provinces, which is recommended, there is a need for national coordination (a national WASHE committee) to deal with policy issues related to inter-ministerial cooperation at different levels.

It is recommended that NORAD see the rural and peri-urban population as the main target groups for water supply and sanitation in the sector programme.

Based on the experience of Western Province, NORAD should support the establishment of a training course in Mongu, for CEP personnel.

In the event of further support to rural water supply and sanitation activities, in other parts of the country, it is recommended that a post be established, at national level, to coordinate the rural sector. Such a post could be initially sponsored by NORAD.

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TERMS OF REFERENCE

for
a
Project Review of ZAM 007
Water Supply and Sanitation Programme
Western Province Zambia

GENERAL

Norway has supported Zambia in developing the Water Supply Sector in Western Province since 1977.

The programme has consisted of 5 programme phases with the following support:

	Allocation (Mill NOK)	Approximate 1990 value
Misc. allocations	19.8	34.0
Phase I (1977-79)	17.2	35.0
Phase II (1980-83)	85.0	153.0
Phase III (1984-85)	45.0	65.0
Phase IV (1985-89)	100.0	118.0
Phase V (1990-93)	37.0	34.0
TOTAL	304.0	439.0

In addition NOK 4.5 million has been allocated for the period 1992-1994 for the institutional strengthening of Mongu District Council Water Supply.

The overall objectives of the programme as specified in the agreement between Norway and Zambia, are as follows:

- to promote health and social conditions in Western Province;
- to improve the situation for women and children;
- to promote self reliance in terms of organisation, manpower and financing in the water supply and sanitation sector;

The present phase V contains the following main activities:

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- Operation and maintenance support for township and rural water supply;
- Additional upgrading of Mongu Township Water Supply;
- Completion of 215 boreholes/wells in rural areas;
- Rehabilitation of traditional water sources;
- Improvement of public standpoints and construction of pit latrines;

In addition comes activities to strengthen the institutional capacity of Mongu District Council Water Supply.

A joint review of the water sector, with some recommendations for future support, was done in 1991, by a group of independent consultants. Since the question of future sector support has not yet been resolved, the report has not yet been approved by NORAD and GRZ, but used as a source of documentation only.

OBJECTIVES OF THE REVIEW

The main objectives of the review are as follows:

- (i) Assess the overall progress of the project in relation to the stated objectives, and the appropriateness of these objectives in relation to Zambia's plans and priorities within the sector.
- (ii) Present and assess the achievements of the Programme to date, and the sustainability of the different components.
- (iii) Make recommendations on the future development of the water sector in Western Province. This should include concrete and practical recommendations on changes or essential additions which the team feels are relevant to ensure the long term sustainability of the sector in Western Province.
- (iv) Present the main conclusions and "lessons learned" which could be useful in the possible preparation of a new NORAD financed Water Sector Programme in Zambia.

The review report will be part of the background material for the discussions between the Government of Zambia and NORAD regarding the progress and the future of the programme at the annual meeting for ZAM 007 in November 1992.

SPECIFIC POINTS TO BE COVERED

Based on extensive discussions with involved parties, on previous reports and on field visits, the team should cover the following aspects of the programme:

1. Programme design and present status.

- a. Make a brief description of the programme as it is perceived today by the involved parties, and describe how it fits in with the present (and planned) organisation and policy within the sector in Zambia.



- b. Appraise the appropriateness of the objectives of the programme in the Zambian context, and assess to what extent the objectives are being achieved. The formulated indicators should be involved in this exercise.
- c. Examine the activities and outputs of the different components of the programme and assess the appropriateness of these as a means of achieving the programme's objectives.
- d. Re-assess the validity of the assumptions made when phase V was formulated.

2. Impact and social issues

- a. To the extent possible the team should make a brief assessment of the social and economic impact of the different components of the programme. This should include an analysis of the programme's impact on women's and children's situation in the Province.
- b. If insufficient measures exist to monitor the impact of the programme, the team should suggest improvements.
- c. Assess whether user groups and local communities have participated in the programme planning and activities, and whether they accept ownership and management of water and sanitation installations.
- d. The team should discuss the gender specific aspects of the programme and the role of women in the programme.

3. Institutional and organisational issues

- a. Analyze the organisational structure of the programme and how it fits into the institutional framework at Central, Provincial and District level, and discuss the cooperation and division of labour between these different levels of Government administration.
- b. Discuss the institutional support given to the districts within the programme, including training, and assess its impact on the capacity of the district administration to manage water supply and sanitation in the future.
- c. Assess and discuss the relevance of sanitation to the goals of the programme, both rural and urban, and make institutional and organisational recommendations.
- d. Assess and discuss the role of the Ministry of Health in the sector in Western Province, especially in relation to the hygiene education component of the programme.
- e. Assess the different administrative and financial procedures in the Programme and how these relate to established government procedures.

4. Technical Issues

- a. The team should assess the appropriateness of the technological level of the different components of the programme. Relevant technical observations and recommendations can also be made by the team.
- b. Briefly assess future development and improvements required in Mongu District's water supply.

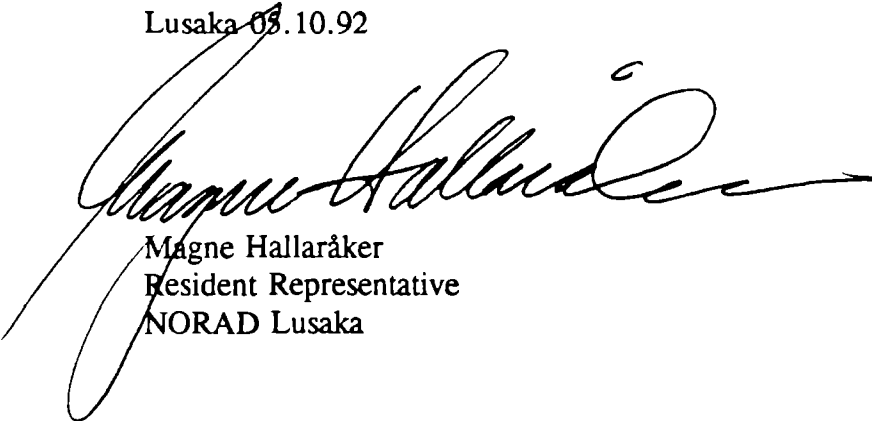
COMPOSITION OF THE REVIEW TEAM

Mr. Aage Krüger	Water Engineer Consultant - Team Leader
Dr. Mubiana Macwan'gi	Coordinator, Health Research Programmes - UNZA
Mr. Anthony Land	Water and Sanitation Sector Specialist/ Social Anthropologist

TIMING AND REPORTING

The review will take place from 12th October to 3rd November. A written report should be completed within that period.

Lusaka 08.10.92



Magne Hallaråker
Resident Representative
NORAD Lusaka

(Literature list attached)

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PROJECT REVIEW OF ZAM 007 - OCTOBER 1992

LIST OF RELEVANT DOCUMENTS

GENERAL DOCUMENTS ON THE SECTOR

1. STUDY OF THE WATER SUPPLY AND SANITATION SECTOR
Volume 1: Current situation options for sector support;
Volume 2: Options for NORAD support;
Final Report October 1991;
2. MINUTES OF THE PROVINCIAL WATER ENGINEERS WORKSHOP ON OPERATIONS AND MAINTENANCE - Department of Water Affairs August 1992;
3. PIPED WATER SUPPLIES OPERATION AND MAINTENANCE - ANNUAL REPORT 1991
Department of Water Affairs - January 1992;
4. OPERATION AND MAINTENANCE STRATEGIES FOR RURAL WATER SUPPLIES IN ZAMBIA WITH RECOMMENDATIONS FOR IMPROVING SUSTAINABILITY - Maurice K. Samani November 1991;
5. Documents from the Workshop on the Reorganisation of the Water and Sanitation Sector, Siavonga 26-30 August 1991;

DOCUMENTS SPECIFICALLY RELATED TO THE PROGRAMME

1. Documents prepared by GRZ for the annual meeting for ZAM 007 to take place in November 1992: PROGRESS REPORT JULY 1991 TO JULY 1992 AND PROGRAMME OF WORK FOR 1993 - Provincial Water Engineer July 1992;
2. WATER SUPPLY AND SANITATION PROGRAMME WESTERN PROVINCE ZAMBIA, DRAFT PROJECT DOCUMENT FOR PHASE VI (1994-87) - DWA April 1992;
3. Bevilgningsdokument BD/AFR:10/92, Institusjonell støtte til Mongu District Council - March 1992 (Norwegian only);
4. MONGU DISTRICT COUNCIL - INSTITUTION BUILDING AND STRENGTHENING OF O&M MONGU TOWNSHIP WATER SUPPLY - PROJECT DOCUMENT, March 1992;
5. ZAM 007 - WATER SUPPLY PROGRAMME, WESTERN PROVINCE, REPORT FROM A VISIT TO LUSAKA AND MONGU MARCH/APRIL 1992 - Scanteam International;

6. ZAM 007 - PLAN OF OPERATIONS AND BUDGET FOR NORAD GRANT FUNDS 1992 - Department of Water Affairs;
7. ZAM 007 - WATER SUPPLY AND SANITATION PROGRAMME WESTERN PROVINCE ZAMBIA, TRAVEL REPORT OCTOBER 1991 - Scanteam International;
8. RURAL WATER SUPPLY, ZAM 007 WATER SUPPLY AND SANITATION, WASHE PROGRAMME - Travel Report Sally Sutton June 1991;
9. ZAM 007 - HIGHLIGHTS ON ACTIVITIES DONE IN THE PERIOD JANUARY 1990 - APRIL 1991 IN THE PHASE V PROGRAMME - Provincial Water Engineer May 1991;
10. Zam 007 - MONGU TOWNSHIP WATER SUPPLY - Fact Finding/Appraisal mission, Final Report April 1991;
11. MONGU DISTRICT COUNCIL - OPERATIONS AND MAINTENANCE OF THE WATER SUPPLY SCHEMES IN MONGU AND LIMULUNGA - A Working Document April/May 1991;
12. ZAM 007 - Travel Report May 1991 - Scanteam International;
13. ZAM 007 - PLAN OF OPERATIONS AND BUDGET FOR NORAD GRANT FUNDS 1991 - DEPARTMENT OF WATER AFFAIRS;
14. BEVILGNINGS DOKUMENT BD/AFR: 11/90 for Fase V av ZAM 007, February 1990, (Norwegian only);
15. ZAM 007 PROGRAMME - Report from an appraisal mission November 1989 - FINAL REPORT January 1990
16. PROJECT DOCUMENT - WATER SUPPLY AND SANITATION PROGRAMME WESTERN PROVINCE - PHASE V - PROVINCIAL WATER ENGINEER MAY 1989;
17. EVALUATION REPORT 1.87 - The Water Supply Programme in Western Province Zambia - The Royal Norwegian Ministry of Development Cooperation 1987;
18. REPORT FROM WESTERN PROVINCE WATER PROJECT ZAMBIA 03.02-31.03.1984, Mette Jørstad;

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Ministry of Energy & Water Development

Mr. Romance Sampa, Permanent Secretary

Mr. Khuti, Deputy director, DWA

Mr. Stian Skarstol, Senior Water Engineer

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Mr. D. Kempken, 2ND Secretary, Economic Cooperation

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Mr. Patel, Engineering Advisor

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Department of Water Affairs.

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Mr. A.M. Likando, Water Engineer.

Mr. Maurice K. Samani, Hydrogeologist - RWS Programme Coordinator

Ms. Catherine Kekelwa, teacher - CEP

Ms. Catherine Lubinda, plumber - CEP

Ms. Albertina Sinyuni, Family Health Nurse - CEP

Ms. Clare Mulopo, Plumber/Bricklayer - CEP

Ms. Muyumbana Likando, Store Keeper

Ms. Inonge Nyekwa, Store Keeper

NORAD

Mr. T. Ulevolden, Mechanical Superintendent

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Mongu District Council

Mr. D. K. Lifumbo, Town Water Engineer

Mr. G.M. Mukongolwa, District Executive Secretary

Ministry of Health

Dr. A. Sitali, Provincial Medical Officer

Mr. R.N. Mwanamambo, Provincial Health Inspector

Ms. Winny Koster, Medical Sociologist

Dr. J. Koote, Primary Health Care Coordinator

Office of the Provincial Minister

Mr. M. Imbula, Assistant Secretary

Mr. V.M. Liswaniso, Acting Chief Regional planner

Mr. Mulungushi, Regional planner

NAMUSHAKENDE.

Water Affairs Dept.

Mr. Simakando, Water Operator In-Charge

SENANGA.

Water Affairs Dept.

Mr. Mundia, Water engineer

Mr. S. Wambinji, Revenue Collector

Ms. Florence Inambao, CEP

Ms. Miriam Inamboa, CEP - Team Leader

Ms. Precious Inambao, CEP

Mr. _____ Water Operator In-Charge

Ms. _____ Water Operator

Ministry of Health

Dr. Joep J.J.G. van Oosterhout, Acting District Medical Officer

ITINERARY

Sunday 11th October 1992

Briefing with NORAD Senior Programme Officer.

Monday 12th October 1992

Introductory meeting at NORAD, Lusaka with Assistant Representative.

Meeting with Permanent Secretary, Ministry of Energy and Water Development.

Meeting with Deputy Director and Senior Water Engineer, Department of Water Affairs.

Meeting with Area Representative, UNICEF, Lusaka.

Meeting with Engineering Advisor, Ministry of Local Government & Housing.

Tuesday 13th October 1992

Meeting with Chief Health Inspector, Ministry of Health.

Meeting with the Second Secretary, Economic Cooperation, German Embassy.

Wednesday 14th October 1992

Travel Lusaka - Mongu

Thursday 15th October 1992

Meeting with the Provincial Water Engineer, DWA.

Meeting with the Mechanical Superintendent, DWA.

Meeting with the Water Engineer, Mongu District Council.

Meeting with the Assistant Secretary, Office of the Provincial Minister.

Friday 16th October 1992

Field Trip - Mongu and Limulunga Township Water Supplies.

Saturday 17th October 1992

Field Trip - Namushakende and Senanga Township Water Supplies.

Sunday 18th October 1992

Report Preparation

Monday 19th October 1992

Meeting with the Provincial Community Education and Participation (C.E.P.) Team

Meeting with the Rural Water Supply Coordinator, DWA

Meeting with the Provincial Medical Officer and Primary Health Care Coordinator.

Tuesday 20th October 1992

Field Trip - Flood Plain Limulunga Mongu District. Rural Water Supplies with RWS Coordinator

Field Trip - Forest Area Lusaka Rd Mongu District. Rural Water Supplies with C.E.P. Team.

Wednesday 21st October 1992

Field Trip - Plain Margin Namushakende Mongu District. Rural Water Supplies

Focus Group Discussion, Senanga District, Rural Water Supplies

Meeting with Water Engineer, Township Water Supplies DWA.

Thursday 22nd October 1992

Field Trip - Improved Traditional Sources - Mongu District

Report preparation

Friday 23rd October 1992

Report Preparation

Meeting with Medical Sociologist, Ministry of Health.

Saturday 24th October 1992

Report Preparation

Sunday 25th October 1992

Report Preparation

Monday 26th October 1992

Meeting with Provincial Planning Unit.

Meeting with Council Secretary, Mongu District Council

Field Visit to Sanitation II with Provincial Health Inspector

Wrap-Up Meeting in PWEs office

Tuesday 27th October 1992

Travel Mongu - Lusaka

Wednesday 28th October 1992

Report Preparation

Thursday 29th October 1992

Report Preparation

Friday 30th October 1992

Debriefing Meeting - NORAD Lusaka

Saturday 31st October 1992

Report Preparation

Monday 2nd November 1992

Submission of Draft Final Report to NORAD, Lusaka

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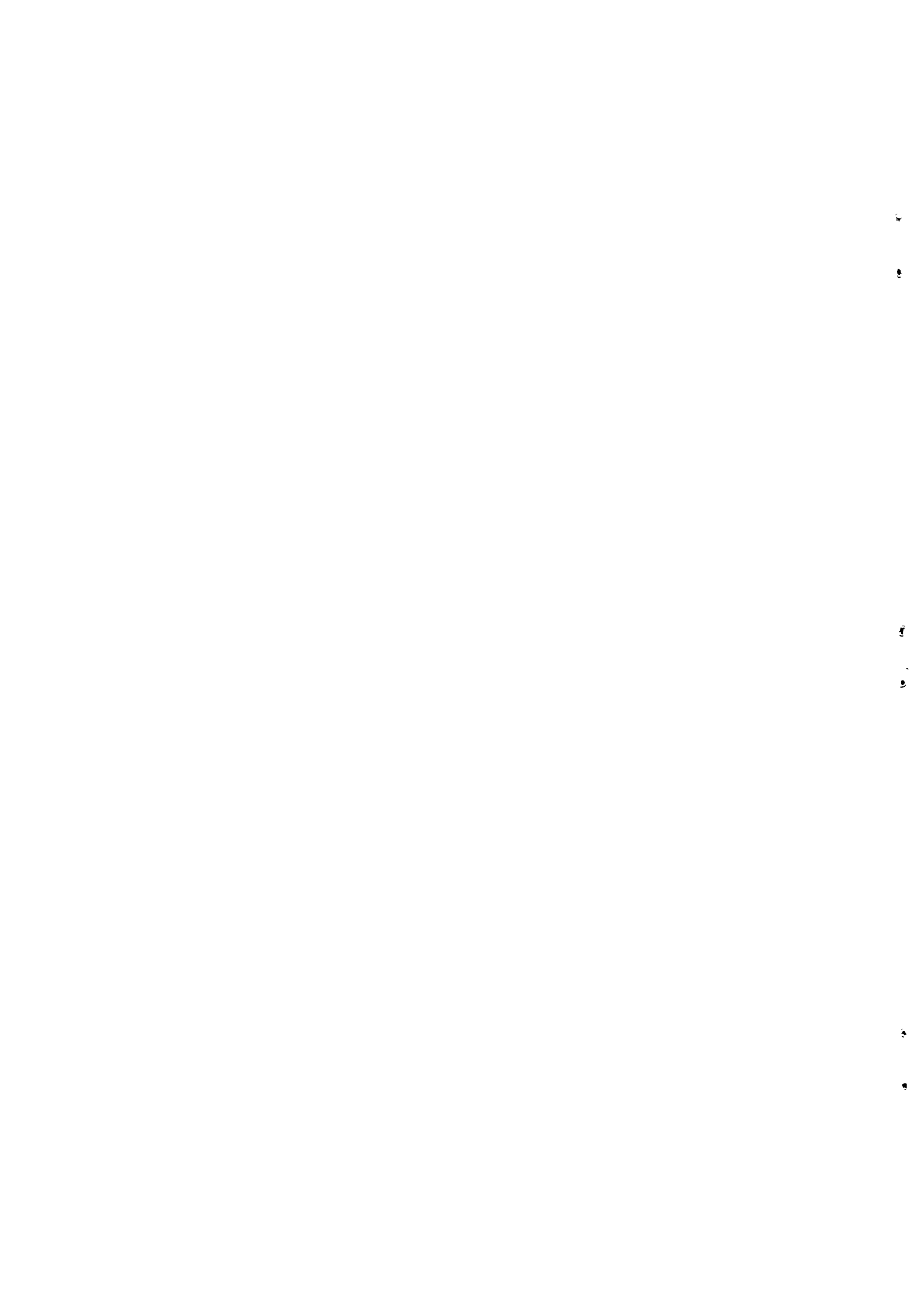
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Scanteam, Age Ronningen.

LOGICAL FRAMEWORK MATRIX FOR WESTERN PROVINCE VILLAGE WATER SUPPLY DEVELOPMENT

SUMMARY	INDICATORS	EXTERNAL FACTORS / ASSUMPTIONS
<p>DEVELOPMENT OBJECTIVE</p> <p>1. Improved health and welfare conditions for the rural communities in Western Province</p>	<p>1. Reduction in water borne diseases in the communities</p> <p>2. Time and energy saved which can be used for more productive purposes</p> <p>3. Increased cooperative activities in the villages.</p>	
<p>IMMEDIATE OBJECTIVES</p> <p>1. Effective and sustained functioning and utilisation of water supply and sanitation systems in the rural communities in the Western Province</p>	<p>1. 90 % of installations functioning at any one time.</p> <p>2. DWA able to construct new installations effectively within given allocations and offer commercial drilling at competitive rates</p> <p>3. WASHE and village water committees functioning and effectively supporting water/ hygiene activities.</p> <p>4. Perceived benefits of water and sanitation activities in the communities</p> <p>5. Observed changes in water/ hygiene behaviour in communities.</p> <p>6. People preferring new to traditional sources.</p> <p>7. People looking after and being prepared to contribute in cash for using new source.</p> <p>8. Extension staff from other departments involved in the water supply system.</p> <p>9. Increased common utilisation of facilities and resources by extension staff.</p>	<p>1. No serious deterioration of other health factors (e.g. nutrition, medical services) or in people's general economic conditions.</p> <p>Economic:</p> <p>1. Funds will be available for continuing the rural w/s programme.</p> <p>2. The water supply will be affordable to the consumers (repairs, spareparts, containers, soap, etc.)</p> <p>GRZ policy:</p>
<p>OUTPUTS:</p> <p>Quantitative:</p> <p>1. 1100 wells constructed and operational by the end of 1993.</p> <p>2. Self-sufficient DWA district facilities and manpower for O&M.</p> <p>3. Functioning WASHE committee structure at provincial and district levels.</p> <p>Qualitative:</p> <p>4. Good quality installations that will ensure continued clean and safe water.</p> <p>5. Qualified DWA manpower that will be able to support the villagers' operation and maintenance of the installations.</p> <p>6. Qualified villagers able to maintain their own installations.</p> <p>Behavioural:</p> <p>7. CEP work has made people accept installations and understand the importance of using clean water and improving hygienic behaviour.</p> <p>8. Villagers having realised the importance of taking up the responsibility for maintaining their own pumps and wells.</p>		<p>4. That GRZ decides on a workable policy for cost recovery for village water supply.</p> <p>5. That GRZ will include Community Participation and Education (CEP) as a necessary part of rural water development and promote intersectoral cooperation, especially between water and health authorities.</p> <p>Political:</p> <p>6. No significant movement of people due to village regrouping.</p> <p>7. No serious land disputes.</p> <p>8. No serious political interference.</p>
<p>ACTIVITIES / INPUTS</p>		

CRITERIA FOR ALLOCATION OF WATER SUPPLY IN RURAL AREAS

Area/Village(s)	WARD		DISTRICT
Contact person (HA ? WC ?)	DATE		SIGNED
I. WATER NEEDS (40 out of 100)	Score	Score	Comments/ measured values
1. Existing supply		allocated	
- sufficient (no queing or waiting to fill bucket)	0		
- insufficient in dry season	10		
- insufficient all year	15		
2. Water quality according to users			Resons ?
- reasonable	0		
- bad	5		
3. Degree of health hazard (by professional)			Any analysis ?
- none	0		
- sometimes	5		
- always	10		
4. Distance to existing dry season source (or wet season if this is farther)			Perceived and actual distance
- less than 15 minutes' walk	0		
- 15 - 20 minutes	5		
- more than 30 minutes	10		
II. DEVELOPMENT POTENTIAL (20 out of 100)			
1. Institutions.			
- none	0		
- planned or existing Local Court, CHW, agric. ext. worker, market, shop, depot etc.	5		
- Health Centre/ school (NB. will automat. qualify)	10		
2. Income generating activities.			
- low or unknown	0		
- obvious	5		
III. TECHNICAL FEASIBILITY (20 out of 100)			Degree of scattered houses
1. Number of households which new supply would serve all year (NOT Includ. houses with exist. source significantly closer) Total in last column			
- Less than 15 houses	0		
- 15 - 30 houses	5		
- More than 30 houses	10		
2. Nearest reliable service center			
- More than 10 km (about two hours' walk)	0		
- 5 - 10 km (1 - 2 hours' walk)	5		
- less than 5 km (less than one hour's walk)	10		
IV. SOCIAL FEASIBILITY (20 out of 100)			
1. Felt need.			
- Request expressed by represent. population			
- No	0		
- Yes	5		
2. Willingness for participation.			
- Community can be expected to fulfill prep. work			
- No	0		
- Yes	5		
- Community proved to be able to work together			
- No	0		
- Yes	5		
- Acceptance of costs for spare and maintenance			
- No	0		
- Yes	5		
TOTAL ALLOCATED SCORE			

NB. Choose correct score for each question.

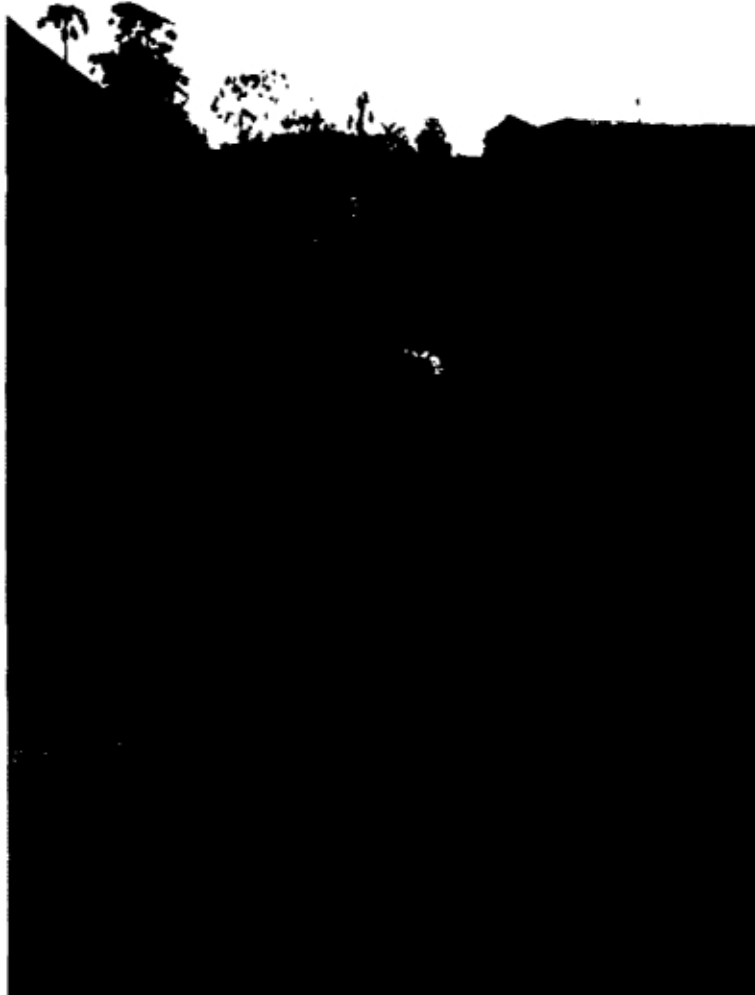
Write in first column. Put relevant comments

or actual values (such as distance to water) in second column.

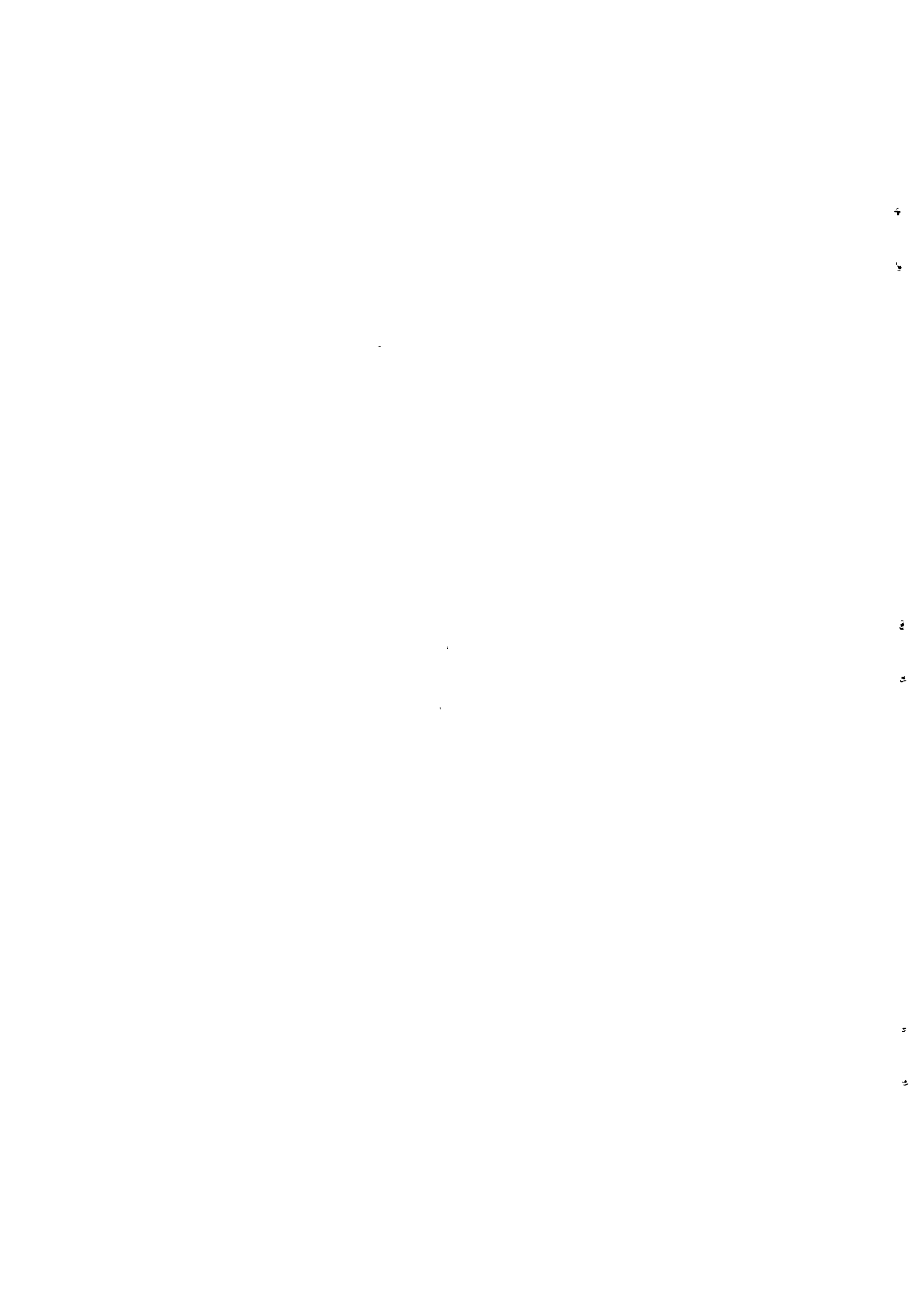
Min. score 60. Min. no. of houses 20

Remarks on local leadership, different tribes to use same supply, etc. (continue on back of form)

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COMMUNAL STAND-PIPE WITH WATER METER
BEFORE SANITATION 1





IMPROVED COMMUNAL STANDPOSTS
SANITATION 1





TRADITIONAL WELL ON THE ZAMBEZI PLAIN

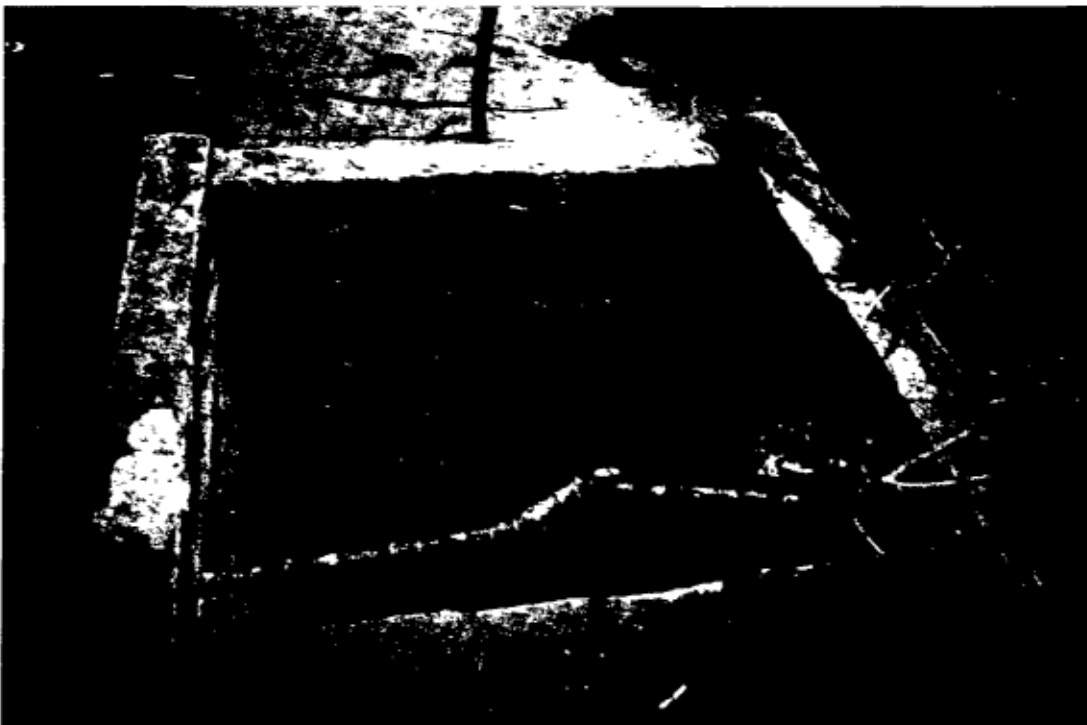


IMPROVED WELL WITH WINDLASS
STILL IN OPERATION

SANITATION II



COLLAPSED LATRINE PIT
TO THE LEFT REMAINS OF OLD PRIVY



LINED PIT



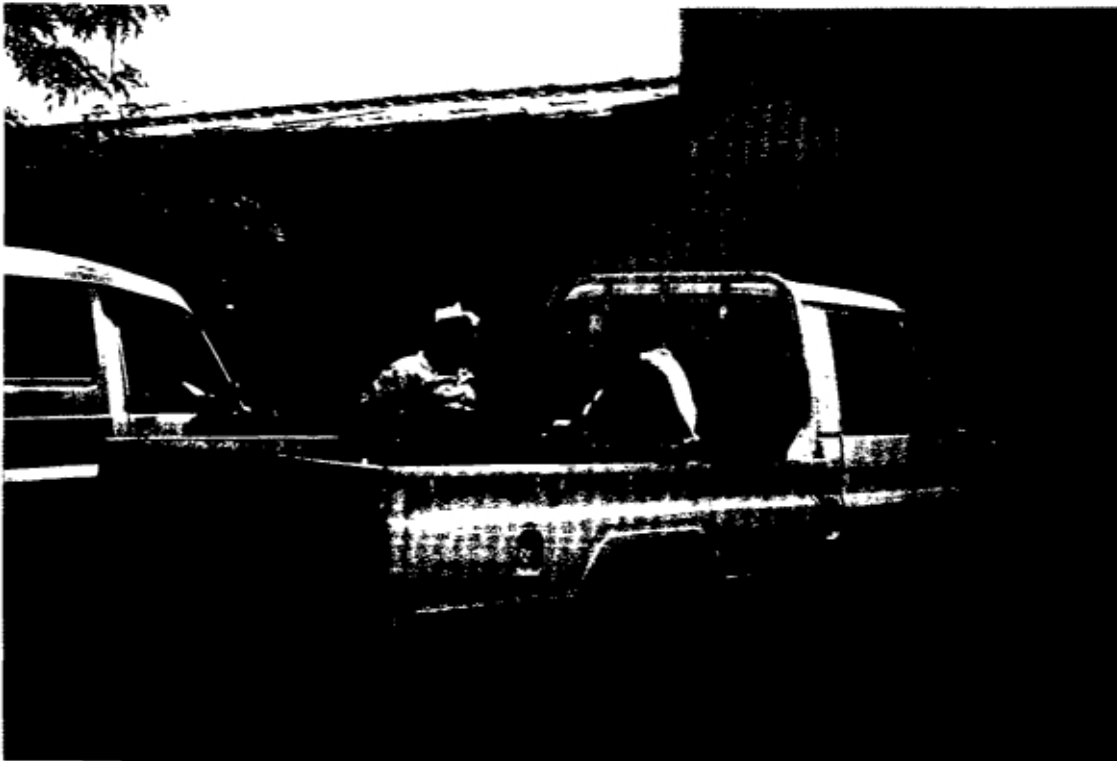
COMPLETED VIP-LATRINE
WITH "HOME MADE" SUPERSTRUCTURE



ANOTHER SUPERSTRUCTURE
ON VIP - LATRINE



VIP- LATRINE WITH SUPERSTRUCTURE
MADE OF CONCRETE BLOCKS



THE CEP - TEAM IN MONGU
READY TO GO OUT IN A VILLAGE

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