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WHO Regional Office for Africa
Brazzaville, Congo

OPERATION AND MAINTENANCE OF URBAN AND RURAL WATER SUPPLY AND SANITATION SYSTEMS

GHANA'S EXPERIENCE

BY

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GHANA

O&M OF RURAL WATER SUPPLY AND SANITATION
GHANA'S EXPERIENCE

INTRODUCTION:

The Ghana Water and Sewerage Corporation (GWSC) is the Government Organisation responsible for both Urban and Rural water supplies, and sewerage and sewage disposal. The Urban water coverage is about 76% and Rural water coverage is 46%. Rural water refers to systems like small pipe-borne systems, mechanised boreholes, drilled boreholes fitted with handpumps, hand-dug wells with handpumps, hand-dug wells with rope and bucket and rain harvesting. The sanitation coverage is about 61% for Urban and 11% for Rural. In Ghana a rural community is defined as a community with population below 5,000.

In this paper I shall dwell mostly on the Operations and Maintenance of the drilled boreholes fitted with handpumps, as this the area which calls for greatest attention at the moment in my Department.

There are presently about 6,800 handpumps on the Maintenance list of GWSC.

Besides this number, the NGO's have installed handpumps which number about 1,400.

2. BACKGROUND:

Following the completion of two large scale drilling programmes which made a significant impact on the coverage of rural water supply in Ghana, maintenance centres were set up to cater for the maintenance of vehicles, equipment and handpumps. The programmes consisted of 2,700 handpumps provided by the Canadian Development Agency (CIDA) which was completed in 1979 and 3,090 handpumps provided by KfW of Germany and completed in 1981.

The CIDA Project covers the Northern part of the country whilst the 3000 wells project covers the Central and Southern parts of the country. The two projects were completed without educational campaign to sensitise the beneficiary communities but later there was a water utilisation programme (WUP) instituted by the CIDA project to animate/educate the communities in the Northern part of the country. The WUP has been going on since 1982 and has brought considerable awareness to the beneficiary communities.

Under the 3000 well project in Southern and Central Ghana, however, there has never been any intensive education campaign. In 1985, the Government introduced a system of tariff to support O&M for handpumps. The purpose of the Government introducing the tariff in 1985 (which is still in force) is to request the beneficiary communities to contribute towards the maintenance of the handpumps and also to make them develop a sense of ownership of the handpumps. The tariff which started as twenty-four Cedis (¢24.00) per household per month has gradually increased to the present level of two hundred and seventy Cedis (¢270.00) per household per month.

After a series of tests of various types of pumps to find the most reliable pumps, the CIDA programme settled on the Monarch and Moyno pumps and the 3000 wells programme settled on the India Mark II and Moyno handpumps.

3. OPERATION AND MAINTENANCE:

The Maintenance Units were set up to perform preventive maintenance on all the handpumps. The Units were well equipped with transport and lifting devices for the underground components of pumps together with workshops and tools.

Initially a mechanic performed inspection visits to each pump once in three months. This was followed by a truck with lifting devices and a team of about 4 to 5 people to repair broken down pumps which had been inspected by the mechanic. GWSC provided the spare parts for the repairs.

Due to high operational cost, the 3000 wells project phased out the Moyno handpumps and replaced them with India Mark II fitted with galvanized riser pipes. Subsequently, the aggressive borehole waters in the Central and Southern parts of the country began to attack the G.I. pipes and rods used as the rising mains, causing corrosion, and imparting taste, colour and odour to the water, thereby making it unacceptable to the communities. With the advice of the German Consultants (Messrs IGIP) attached to the project, GWSC requested for funds from the German Government to purchase light weight stainless steel pipes and rods to replace the galvanised iron (G.I.) pipes and rods. The Maintenance Unit has since replaced all the G.I. pipes and rods with stainless steel. The India Mark II handpump has received several modifications to make it suit Local conditions and the resulting pump has since been referred to as modified India Mark II (Ghana Version) or simply Ghana Modified India Mark II. These modifications have changed the pattern of maintenance. With the significant reduction in weight it is now possible to do away with the heavy trucks, lifting devices and tackles to resort to simpler repair methods.

Currently, a mechanic on a motorbike can move to a pump site, engage the services of two villagers and using simple clamps can repair all faults on the handpump including lifting and replacing the riser pipes, rods and cylinders. The same mechanic collects the revenue for GWSC. The maintenance system has been perfected to the extent that not more than ten per cent (10%) of pumps are down at any time and downtime periods are minimal.

This type of maintenance system being ran by GWSC is often referred to as Centralised Maintenance System, as it is organised with Central direction by the GWSC. In effect, however, the GWSC structure is decentralised to the Regions and Districts.

The main constraint to the operation of the system is the collection of tariff (revenue) by GWSC.

Many communities owe huge arrears and are even scared to approach the GWSC to negotiate or even pay current bills. Part of the reason may be attributed to the late introduction of the tariff when communities had already got used to fetching water for free. Another may be due to the lack of effective education campaign. And lastly, the situation was aggravated when the corroding galvanised pipes made the waters distasteful.

4. NATIONAL POLICY:

In spite of the high technical success of the Centralised maintenance system being run by the GWSC, there is a lot to worry about when one considers the sustainability of the O&M system. This is because the success depends greatly on Donor inputs. There is difficulty in collecting tariff due to mistrust and yet the level of tariff can barely meet running costs even without spare parts. Government has therefore decided to introduce community management as a new strategy for the management of rural water supply and sanitation.

To do this, the Ghana Government has approved the raising of the status of the Rural Water Department of GWSC to that of a Division, to be headed by a Deputy Managing Director.

The Division will be called "Community Water and Sanitation Division" with the following objectives:

(a) Provide reasonable access to safe water for communities with populations over 75 that will contribute towards the capital cost and pay the normal operations, maintenance and repair costs of their facilities.

(b) Ensure sustainability of these facilities through private sector provision of goods and services and public sector promotion and support.

(c) Maximize health benefits by integrating water, sanitation and hygiene education interventions.

The new Division became necessary because some beneficiary communities have accused the GWSC of being urban biased. Public opinion also argues that since GWSC has difficulty in maintaining about 7,000 handpumps now, due to the low payment of tariff and more boreholes are being drilled, it will be even more difficult to maintain these handpumps in future especially, because of their scattered distribution. Therefore there is the need to involve the Private Sector and the beneficiary communities in the operations and maintenance of these handpumps. This means that the tariff system will be abolished and consumer communities will be asked to pay for actual services rendered by repair men. GWSC will monitor, facilitate and supervise the activities of the private sector.

With this the Government through GWSC will become a Promoter instead of a Provider of services. This will also be in line with Ghana Government's decentralization policy which is on-going.

For the new national strategy being embarked upon to be successful, a number of principles have been identified as pre-conditions for effective and sustainable operation and maintenance of various water supply and sanitation systems. These are:

(1) The provision and rehabilitation of water systems should be demand driven. Communities should determine the type and level of service which they can afford to operate and maintain.

(2) In principle, water supply should be considered as an economic commodity and managed in accordance with good business practices. However, the lifeline provision of water must be assured for the poorest communities which cannot afford to pay for water.

(3) Women must be fully involved and supported to assume a pivotal role in all stages of operation and maintenance.

(4) Operation and maintenance of water supply systems should be managed by financially viable and transparent agencies responsible to the local users.

(5) Effective control of water systems should be vested in the local communities responsible for their operation and maintenance.

(6) An enabling environment should be promoted to intensify the involvement of the private sector and Non-governmental Organization (NGOs) in operations and maintenance.

5. THE PROCESS OF CHANGE:

A Water and Sanitation Conference was held in Accra in 1987, during which Community Participation was identified as crucial as it leads to self-reliance, promotion of ownership as well as sustainability of the system.

After this Conference, it became the policy of GWSC to include intensive animation/education of beneficiary communities in all new projects. User communities are also called upon to pay a commitment fee before benefiting from the project. This fee also includes the initial deposit for maintenance of the Handpumps. Examples of the application of this policy may be found on the JICA (Japanese International Cooperative Agency) project in the Nanumba-Konkonba area in the Northern Region of Ghana, the Berekum-Jaman area in the Brong-Ahafo Region of Ghana and Sefwi Wiawso area in the Western Region of Ghana. In all a total of 466 boreholes were drilled by the Japanese experts working in partnership with Ghanaian experts from the Drilling Unit of the GWSC.

Other projects like the CFD (Caisse Francaise de Developpment) project in the Central Region of Ghana, UNDP/World Bank project in two districts in Eastern Region of Ghana, UNDP/World Bank project in two districts in the Volta Region of Ghana, Danida project in Volta Region of Ghana were also modeled under the same policy and are being executed as Pilot Projects to test the principle of Community Management.

The main objectives of these projects are:

(1) To increase the Rural water coverage in the various project areas.

(2) To provide decentralised management of maintenance of handpumps owned by the beneficiary communities.

(3) To establish an effective and efficient decentralised spare parts distribution network.

(4) To sensitize and animate rural communities through continuous educational campaign with extension officers so that they become assertive and accept full responsibility of the handpumps.

Consequently a National Community Water and Sanitation Strategy has been evolved and a Strategic Investment Plan (SIP) has been prepared. The World Bank is assisting GWSC to implement a Pilot Scheme in three Regions, namely Ashanti, Brong-Ahafo and Western. Regional Community Water and Sanitation Offices are being established in Brong-Ahafo, Ashanti and the Western Regions of Ghana.

6. PERSPECTIVE OF THE FUTURE:

The perspective of the future is that a well established Community Water and Sanitation Division within GWSC will oversee an accelerated development of Water and Sanitation throughout the country. Institutional framework and policy guidelines have all been set out including the setting up of spare parts distribution network, a definition of the roles and responsibilities of the Community, the District Assembly, as well as Regional and National units of the CWSD.

(a) Community Level:

In future all projects will operate on a demand driven approach to ensure that limited government funds are channeled to communities. that are willing to maintain their new or improved water supply and sanitation systems.

Therefore the Communities will apply for financial grant through their District Assemblies. Before a grant is provided, a Water and Sanitation Committees should be formed, a bank account should be opened and an initial contribution

to the Capital Cost deposited. Other pre-project obligations if necessary should also be met (like clearing of sites, preparing of access roads, etc.). During the planning, construction and follow-up periods, the Community should participate in Health Education and Training and should be responsible for improving environmental sanitation. The Communities should also be responsible for the operation and maintenance of their water supplies including the collection of revenues.

(b) District Level:

Each of the 110 district assembles will be responsible for promotion and offering assistance to interested Communities who wish to obtain grant for improved or new water supply and sanitation systems. The assemblies will form District Water and Sanaitation teams who will carry out the work of promotion. Actual construction will be done by Contractors and animation by partner Organisations.

(c) Regional Level:

The Regional CWSD (Community Water and Sanitation Division) will be set up in all the 10 regions of the country. The division in the region will be made up of specialists in Planning, Community Development, Sanitation, Hydrogeology, Rural Water and Sanitation Technologies Administration and Accounts. They will be responsible for supervision and monitoring of all rural water and sanitation projects in the districts.

(d) National Level:

The National CWSD will be responsible for Planning and Coordinating all CWSD projects, preparing annual workplans and budgets, monitoring, periodically evaluating and updating policies and setting standards and guidelines. It will also mobilise national and international funding and support for the programmes, liaise with other ministries and coordinate projects supported by NGOs (Non-Governmental Organizations) and ESAs (External Support Agencies). Other functions are preparation of designs and specifications.

7. CONCLUSION:

Although the Centralised Maintenance System now being employed is technically successful, as it ensures preventive maintenance and makes monitoring very easy, the collection of tariff (revenue) is very difficult and hence sustainability of the system is in question. This is even more suspect when the external support now being enjoyed is over and the system is out of the project environment. This is why the theory of Community Management has become attractive and needs to be pursued.

Community Management of Rural Water and Sanitation Systems on the other hand which is quite new in Ghana appears to be a sustainable option but problems like preventive maintenance and monitoring need to be addressed.

Also the efficiency of the Private Sector in the marketing of spare parts and ensuring that they give a fair deal to the user communities are subjects to be scrutinised. Due to these reasons, Ghana is being cautious by implementing Pilot Community Management Projects before embarking on full scale application of the strategy.

Mr. Chairman, ladies and gentlemen, perhaps I shall have a more interesting account to give you in a year's time when more lessons have been learnt from our experiments.


UPPER WEST
UPPER EAST
Bolgatanga
Wa
NORTHERN
Tamale
Bole
BRONG-AHAFO
Wenchi
Sunyani
VOLTA
ASHANTI
Kumasi
Ho
EASTERN
Koforidua
Accra
CENTRAL
GT. ACCRA
WESTERN
Cape Coast
Sekondi
Takoradi

REGIONS

OPERATION AND MAINTENANCE OF URBAN AND RURAL WATER SUPPLY AND SANITATION SYSTEMS GHANA'S EXPERIENCE

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OPERATION AND MAINTENANCE OF URBAN AND RURAL WATER SUPPLY AND SANITATION SYSTEMS GHANA'S EXPERIENCE

1.0 **INTRODUCTION:** Adequate and safe water supply coupled with basic sanitation are essential to the building of good health. Despite efforts by relevant sector ministries, external agencies and NGOs in Ghana to provide communities with basic sanitation facilities there is still a high rate of water and excreta related diseases especially faeco-oral diseases like diarrhoea, enteric fevers, dysentery etc. A number of reasons could be attributed to this state of affairs. Poor personal and domestic hygiene , inadequacy of water supply and sanitation facilities,deficiencies in operation and maintenance of existing facilities among others are contributing factors leading to this situation.

This paper will focus on the operation and maintenance of sanitation systems. My colleague from Ghana Water and Sewerage Corporation will dwell on the water supply aspect.

2.0 **SANITATION SYSTEMS IN USE**

2.1 Traditional pit (trench) latrines

2.2 VIP latrines

2.3 Flush systems/Septic Tank Latrines

2.4 Bucket Latrines

3.0 **COVERAGE OF SANITATION FACILITIES**

It is estimated that 60 percent of the population have access to trench/VIP latrines, five percent to bucket latrines and one percent to flush toilets, the remaining having no facilities.

4.0 **CURRENT STATE OF SANITATION FACILITIES**

Against the background that only a small fraction of the population have access to acceptable standards of excreta disposal facilities there would obviously be problems with overloading of existing ones and open defaecation. The following describes the present situation on sanitation facilities in the country.

4.1 Public Toilets (VIPs/Septic Tank)

In several instances households depend on overloaded/run-down public toilets for domestic use while others practise open defaecation on bush paths or the beach front. The public toilets are all operating below the minimum acceptable standards. Supply capacity is far below actual demand for use.

4.1.1 Trends in VIP Use

The traditional pit latrines create obnoxious odours and attract flies. Because of the difficulty in recruiting labour to remove excreta and costs involve in constructing and operating modern water dependent excreta disposal systems, VIP latrines are being viewed as a viable alternative and various District Assemblies are actively promoting their use. However, in most cases the communal VIPs are overloaded which defeats their working principle.

4.2 Flush Toilets

In some cases households that have water closet systems either do not have field disposal systems or have faulty subsoil structures for use as soakaways, leading to to premature failure of the system. The consequence of this is a high dependency on limited supply of cesspit emptiers.

4.3 Bucket Latrine:

The traditional system of conservancy labourers emptying buckets into holding tanks has systematically deteriorated to a point of failure. In some areas like the Accra Metropolitan Assembly the technology of emptying buckets into night soil containers has been introduced. It poses a health hazard when containers get full and are not serviced on time.

The Assemblies can no longer afford the services of conservancy labourers for emptying bucket latrines leading to a partial private sector delivery option. In several instances, either the householders or conservancy labourers empty the buckets into nearby paths, the sea, the lagoons, drains or any of such unauthorised disposal methods.

4.4 Final Disposal of Excreta

There are at present only three (3) community water-borne (conventional) sewerage systems in Ghana at Tema, Akosombo and parts of Accra. There is a general lack of a centralized final disposal strategy for human excreta. For example in Cape Coast, Elmina and other towns along the coast, the sea is the receptacle for raw sewage in competition with tourism prospects, while in the hinterland the unsuccessful attempt at practicing the trenching technology has led to pollution of ground water systems.

5.0 CONSTRAINTS TO OPERATION AND MAINTENANCE OF SANITATION SYSTEMS

5.1 Lack of Coordination: There is no existing, institutionalized and functional inter-institutional body or arrangement for coordinating various aspects of waste management and the various agencies involved in the country's waste management processes.

It has therefore not been easy to coordinate actions and plans from Ministry of Environment, Town and Country Planning Department, Ministry of Local Government and Rural Development, Ministry of Health etc.

5.2 Overloading of Sanitation Facilities: As mentioned earlier, the malfunctioning of the public Septic Tank latrines and particularly VIPs due to overloading is a major problem in the operation and maintenance of public toilets. This problem has arisen because the population is growing at a fast rate and the majority depend on public toilets.

5.3 Defects in Construction: The building of excreta disposal facilities are small projects which big reputable contractors in Ghana do not undertake.

As a result incompetent, small contractors undertake such projects without any technical assistance and direction from qualified staff. This creates operational problems for such sanitation facilities.

5.4 Finance

5.4.1 Financing of Sanitation Projects/Facilities
Past experience has shown that most District Assemblies in the country are unable to generate enough revenue to provide excreta disposal facilities. As a result these Assemblies are not in the position to provide incentives or assistance to private individuals in the districts who need assistance to build their own household facilities.

5.4.2 Funds for Capital Costs: Funds from the collection of user-fees is not adequate for the procurement and replacement of equipment, plants and vehicles.

5.5 Public Participation: Inadequate public awareness regarding problems of waste management contribute to the persistent practice of disposing of excreta in the drains and vacant plots. The education of the public will facilitate revenue collection.

In addition the District Assemblies are unable to adequately mobilise, assist and coordinate clean-up campaigns initiated by various NGOs and other groups.

5.6 Legislation: There is a lack of legislation (National Sanitation Strategy) defining the roles and responsibilities of government and other agencies.

5.7 Human Resource: There is a lack of appropriate mix of professional and non-professional level manpower. Additionally there is a lack of competent high level professional expertise.

5.8 Institutional Constraint: Low priority rating of the sanitation sector in resource allocation where the sanitation department is a part of a major development sector. eg. health sector, local Government sector etc.

6.0 **CONCLUSION:**

There would obviously be a marked improvement in the operation and maintenance of sanitation systems if workable and realistic strategies are mapped out to address the aforementioned constraints.
We must however bear in mind that it takes concerted effort and sustained action backed by political commitment to achieve a satisfactory level of sanitation.

REFERENCES:

1. Accra Metropolitan Assembly/Waste Management Department
FIVE YEARS DEVELOPMENT PLAN (1992 - 1996)

2. Paper on Experiences in Excreta Disposal in Ghana by Henry Noye-Nortey, Head/Environmental Health Division, Ministry of Health, Ghana.

3. Volume 1 - Summary Report on Findings and Recommendations applicable to all settlements under the proposed Urban 3 Programme.

4. Ghana Water and Sewerage Corporation Survey on Sanitation Coverage in Ghana.

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Recommendations

1. There should be a clear policy on sanitation defining the roles and responsibilities of relevant agencies.

2. The District Assemblies should be strengthened to collaborate with communities to construct, operate and maintain sanitation facilities.

3. There is the need for an extensive and sustained hygiene education to enhance community participation in sanitation projects and the practice of sound personal and environmental hygiene.

4. High calibre personnel should be trained and put under the appropriate unit or department within the District Assemblies to support communities in the management of sanitation projects/facilities.

5. Sanitation bodies should be set up at the National, regional and district levels to effectively monitor and evaluate the performance of sanitation facilities.

KENYA

SANITATION

In kenya, the most widespread form of water contamination results from disease-bearing human wastes. These wastes pose great health risks for the people who are compelled to drink and wash in untreated water.

In 1990, only 50% of Kenya's population had access to a public sewer, septic tank, or pour or flush latrine, ventilated improved put (VIP) latrine or simple pit latrine: the remaining 50% did not enjoy adequate sanitation. There are again significant interprovincial variation, with Central Province having the highest rural access (60%) and Eastern Province the lowest (26%). Access to adequate sanitation can be analyzed in the same categories as access to safe water the following areas:-

SANITATION IN MEDIUM AND HIGH POTENTIAL AGRICULTURAL AREAS

Most Kenyans live in areas of medium and high agricultural potential, where simple pit latrines are the main means of excreta disposal.

Figure 28 shows the means of excreta disposal in five district in Kenya's highlands (Embu, Nakuru, Muranga, Kakamega and Kisii). While about one fifth of the population, has access to VIP latrines, access to simple pit latrines varies enormously, from a low of 17%

in Kakamega to a high of 53% in Embu. More than half of the population of both Nakuru and Kakamega have not sanitary means of excreta disposal and this pattern prevails in all high and medium potential districts west of the Rift Valley. By contrast, the pattern in Embu and Muranga, where one-quarter to one-third of the population has no means of adequate sanitation, is repeated in all the districts in the highlands east of the Rift Valley.

SANITATION IN SLUM AREAS

Slum area, which are unplanned urban extensions, are found in virtually all urban centres in Kenya and are generally characterized by poor access to adequate means of excreta disposal. Figure 29 shows that 56% of the slum population of both Kisumu and Nairobi have no access to appropriate means of excreta disposal. Because these data are drawn from the three principal urban areas in the country, they are considered to be representative.

SANITATION IN FLOOD-PRONE AREAS

The major difficulty in providing adequate sanitation in flood-prone areas is devising an adequate and cost-effective means of excreta disposal. High water levels prevent pit latrines from providing a solution: pit latrines re in fact health hazards in flooded areas since their contents soon mix up with water used for drinking and for other household purposes. The result is a high incidence of diarrhoea, and the prevalence of diarrhoea in these

areas indicates the extent of this contamination. Unfortunately, even though pit latrines contribute to disease, these are the only means of excreta disposal found in Kwale, Busia and South Nyanza - high water table areas found around Lake Victoria and in the Coast Province. It is surprising that the provinces containing these districts (Coast, Western and Nyanza) have the highest incidence of diarrhoeal disease in Kenya.

SANITATION IN ARID AND SEMI-ARID AREAS

Pit latrines are also the only means of adequate sanitation found in Kenya's arid and semi-arid land areas, which constitute 80% of Kenya but contain only about 20% of its population. Yet coverage is very low, reaching a high of 26% in Wajir and a low 2% in Turkana. These very low levels are partly the result of the population's nomadic style of life. Fortunately, frequently movement and low population densities somewhat mitigate the ill-effects of poor sanitation.

KENYA (CASE STUDY)

Table 14: Type of Excreta disposal facilities available - Migori District

Area Type	Sewer septic tank	Ordinary Latrine	VIP Latrine	None
Rural	0.3	32.4	0.3	67.0
Urban	0.3	85.6	3.0	11.0
District Total	0.3	35.8	0.5	63.4

Note that latrine coverage stands low at 36.6% but the degree of satisfaction by inspection and observation is quite good (87.0% as shown below).

Figure 3: Access to Satisfactory Excreta Disposal Facilities - Migori District

Unsatisfactory facility	Satisfactory facilities
Rural 11.7%	88.3%
Urban 19.9%	80.1%
District Total 13.0%	87.0%

Table 16. Factors Inhibiting Latrine Construction - Migori District

Area Type	Other	High cost/lack of funds	Soil Profile (loose/rocky)	Does not see need for one
Rural	11.0	46.1	26.6	16.0
Urban	2.9	41.2	0.0	55.9
District Total	11.2	46.1	26.2	16.5

Majority of households without latrines (46.1%) attributed that to high construction cost or lack of funds for that purpose.

Table 18: Cost of Latrine Construction - Migori District

Area Type	Less than Ksh 3000	Ksh 3000 - 6000	Ksh 6000 - 19,000	Ksh 10,000+
Rural	94.5	4.9	0.4	0.2
Urban	61.1	34.4	4.4	0.0
District Total	90.0	9.0	0.9	0.2

Table 18 above shows that 90.0% of the latrines available cost less than Ksh3000 to construct.

Table 21: Percentage Excreta Disposal for Household NOT Using Latrines- Migori District

Area Type	In the Bush	Through cat method	Behind the House	Wrap in paper & Dispose to latrine	Neighbours
Rural	58.0	28.0	0.1	13.2	0.7
Urban	1.0	29.5	0.0	69.5	0.0
District Total	56.3	28.0	0.1	14.9	0.7

Bush method is loading at 56.3% followed by Cat method 28.0% and designate hygienic place e.g. paper or pot and later disposal off in the latrine account for 14.9%. Those going behind their own houses and their neighbours latrines are quite low 0.7% and 0.1% respectively.

Table 32: Latrine Coverage Versus Common Disease Found

Latrine Type	Malaria	Bilharzia	Eye diseases	Intestinal worms	Scabies	Diarrhoeal Disease
Sewer	0.3	0.0	0.0	0.0	0.0	0.0
Ordinary	38.8	9.1	30.8	24.0	5.0	20.0
VIP	0.6	0.0	0.0	0.0	0.0	0.0
House	60.2	90.9	69.2	76.0	95.0	80.0

The latrine coverage has got a negative effect on the disease in the sense that the lower the coverage, the higher the chances of infection.

Figure 5: Latrine Usage by Household Family - Migori District

Some/all family members don't use	All family members use
Rural 34.7%	65.3%
Urban 28.1%	71.0%
District Total 33.7%	66.3%

Table 19: Factors that Hinder Latrine Usage by Some/All Members of Households - Migori District

Area Type	Age Too young too old	Beliefs/customs/ taboos	Both age and beliefs
Rural	99.3	0.5	0.2
Urban	100.0	0.0	0.0
District Total	99.2	0.6	0.2

The age factors dominate the factors hindering latrine usage (for those with latrine) at 99.3%

OPERATION AND MAINTENANCE OF RURAL AND URBAN WATER SUPPLY IN KENYA.

1. Introduction

Kenya, an Eastern Africa country covering 583,000 Square kilometres lies between 4 degrees North and 5 degrees South ,34 degree East and 41 degree East and is bordered by Ethiopia to the North, Sudan to the North West, Uganda to the West, Tanzania to the South, Somalia and Indian Ocean to the east. Its altitude ranges from 0 m a.s.l. at the east coast to 5200m a.s.l. at the peak of Mount Kenya, the second highest peak in Africa.

Kenya has two rain seasons namely the short rains which start in late October and tail off in December and the long rains which occur during the months of April, May and June the mean annual rainfall is around 815mm. The distribution of the rains is very uneven, with more 80% of Kenya land mass receiving less than 750mm. of rain per year. The mean run off amounts to 77mm. or nearly 9.5% of the mean rainfall. As a result of this low runoff, Kenya is not endowed with many permanent rivers. In fact there are only five such rivers.

Kenya has a population of about 25 million people of which around 6 million is Urban and 19 million Rural. The population distribution is influenced to a large extent by the availability of good agricultural land and therefore on the amount of rainfall. As a result about 80% of Kenya's population is found is only 20% the country. Accordingly the rural population density which

ranges from 2 persons/km2.to 400 persons/km2. greatly affects the provision of basic services including water supply.

2. Appointment of water undertakers under the law:-

The operations of water supplies in Kenya is governed by the Water Act CAP 372, laws of Kenya. After consultation with the Kenya's Water Board, the Minister in charge of water affairs appoints water undertakers who are responsible for the provision of an adequate supply of water in the area within their limits of supply. According to the Water Act, no local authority shall supply more than two households or more than 5m3 of water a day unless it is a water undertaker. Similarly besides local Authorities, no person shall supply more than twenty households or more than 50m3 of water a day, for domestic purposes or more 100m3 of a day for any purpose, or purposes, unless he/she is a water undertaker. Any local authority or other person who supplies water in contravention of the above conditions shall be guilty of an offence. However the above conditions do not apply in respect of the supply of water by either local authority or other person to its or his employees or in respect of the supply of water on the premises of any hospital, factory, school, hotel, brewery research station or any other public institution.

3. Major water undertakers in Kenya.

Water supplies in Kenya are operated and maintained by three main groups. These include (i) government

organisations, (ii) self-help groups and (iii) institutions

(i) Government Organisations namely the Water Department within the Ministry of Land Reclamation, Regional and Water Development; the National Water Conservation and Pipeline Corporation, a state Corporation within the Ministry of Water Development and eleven municipal councils within the Ministry of Local Government and Urban Development. These three control over 80% of water operations in the country.

(ii) Self-help groups mainly operate simple rural water supplies most of them gravity systems. these water supplies are located in the high potential of Kenya where the population are over 100 persons/km2.

(iii) Institutional water supplies are mainly run by public institutions such as schools which are far from government water supplies. Most of these are on deep ground water where submersible pumps are used to extract the water from the ground.

4. Water Tariffs and cost of Water Production:

All the appointed water undertakers a required by law to use a water tariff that has been approved by the Minister in charge of Water Affairs. The existing water tariff for the water supplies under both the Water Development Department and the National water conservation and pipeline corporation as shown below.

WATER CONSUMPTION m3	URBAN Kshs/m3	RURAL Kshs/m3
from 0 - to 10	3.50	3.00
over 10- to 30	5.00	3.50
over 30 to 50	7.50	5.00
over 50 to 100	10.00	5.00
over 100◆	12.50	7.00

The cost of water production depends on source of water and the means of conveying the same from the source O&M via treatment plant to the consumer. the mean unit cost of water production for various water supplies in Kenya have been found to be as follows:

SCHEME TYPE	PRODUCTION COST PER M3 Kshs.
Gravity	4/= to 6/=
Electricity pumping	8/= to 12/=
Diesel pumping	18/= to 25/=

5. Funding of water supply operations

The Water Department by far is the largest actor in rural and urban water supply development, including operation and maintenance. The Department operates and maintains over 680 water supplies spread through the country, 120

of which are urban and the other 560 are rural. The budgeting for recurrent funds need for operating the water supplies the water development Department are done centrally. This budget is submitted to the Treasury which in turn allocates the available funds, to this ministry. This financial years recurrent allocation of Kshs. 988 million, as compared to last financial year's allocation of around Kshs. 697 million has gone a long way towards improving the operations of water supplies. All the same it is worth noting that nearly 70% of the Ministry's recurrent budget goes towards meeting personnel costs and only about Kshs. 250 million is available for operating expenses including running of water schemes.According to the existing water tariffs, the Ministry collects nearly Kshs. 72 million from water sales which according to the Government policy is the consumers contribution towards provision of water.(1 US Dollar = 70 Kenya shillings (November 1993) sustained at the same proportion.

The National Water Conservation and Pipeline Corporation supposed to operate and maintain commercially viable large water supplies and therefore collect enough revenue to sustain its operations. However the delineation of functions between the Water Development Department and the National Water conservation and Pipeline Corporation has not been clearly defined.

All the municipal councils who are water undertakers operate their water supplies from the revenue they collect from water sales. Infact most of the councils

collect so much money that water revenue is used to finance other activities of the councils.

6. Water Coverage:

The estimates indicated that nearly 14 million people have access to improved water supply. This is nearly 54% of Kenya's present population of 25 million people. This 14 million consist of 4.6 million or 75% of the urban population and 9.4 million or around 50% of the rural popula[illegible]

However, Kenya has experienced a prolonged drought for the last 3 consecutive years. Rivers have ceased to fl[illegible], springs have disappeared and both shallow wells and deep boreholes have dried up. This has been compounded by the high population growth estimated at 3.5% p.a. As a result many water supplies throughout the country have been adversly affected.

7. Constraints experienced in O[illegible]

The performance of water scheme in the country varies some scheme provide a high level of service to consumers while others experience difficulty in meeting the water demand resulting in shortages over varying periods. The main reasons for poor operations of water supplies have been identified as follows:-

a). Low generation of revenue to meet O&M costs. The tariff levels are in many cases are insufficient to finance the purchase of treatment chemicals, fuels, and maintenance requirements. the level of tariffs cannot be increased to reflect the production costs in many cases due to the

consumers' inability to meet the charges, especially in rural areas where there are low level of incomes.

b). The cost of spare parts (most of which are imported) are high and it is not possible to maintain adequate stock levels to enable operators to attend to breakdowns promptly.

c). There is passive community involvement in management of w/s due to insufficient community mobilization prior to construction of the schemes.

d). There is a lack of adequate qualified operators, leading to the employment of inexperienced/unqualified personnel to maintain equipment in the water supplies. From the low operating budgets of many schemes, it is not easy to attract staff who can competently attended to the equipment.

e). The level of technology used in some cases is to advanced for the operation staff and communities served by the project. A major breakdown would therefore require technicians who are not readily available at the community level.

f). In many cases extension have been made beyond the design capacity or limits of supply of the scheme, thus leading to reduced supply capacity to meet the increased demand. There is generally a shortage of sufficient funding to finance regular rehabilitation/augmentation of water schemes once the design periods have been exceeded.

(g) Many of the water supplies were design in the early 1970's with design life of 20 year's Hence design exceeded.

8. Future plans

The future plans of the Ministry in improving water services are as follows:-

8.1. Increased community participation, leading to handing over of government projects to the communities. This has already been achieved in areas where the communities have been prepared and demonstrated their ability & adequately run the water projects.

8.2. Decentralisation of budgeting and resource allocation from National to district level. this will be facilitated by the setting up of District Water Funds, which will be revolving funds operated by the District Water engineers for operation and maintenance of water supplies.

8.3. Improving the technical ability of Local Government Authorities to run Rural Water Supplies in the Local Councils.

OPERATION AND MAINTENANCE OF RURAL AND URBAN WATER SUPPLY AND SANITATION SYSTEMS

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GENERAL OVERVIEW

Generally all the key issues addressed by the Working Group in Geneva on the operation and maintenance of water and sanitation systems,are still existing in Lesotho.To a greater extend issues with higher frequencies include:-

(a) Insufficient and inefficient use of funds.
(b) Lack of land management.
(c) Inadequate policies,legal frameworks and over lapping responsibilities.

Administration of sanitation has for some years been a problem because of lack of central planning and involvement of line organisation whenever a project is piloted or incepted. The conceptual framework is really with the implementors, whereby the focus is on reaching positivity, but how to arrive at that the situation is either overlooked or addressed at its minimum.

Sustainable progress is one other aspect that is threatening sanitation projects or structures because of quite a number of factors including the following:-

(i) Reliance on donor funding especially whereby capital investment is involved.
(ii) Failure of the Government to obsorb the projects after facing out of donor funding.

Because the government and other organisations are not subsidising the sanitary facilities, affordability is one other set back; the whole cost of the facility is solely with the individual householder/institution whose economic status is very low. Another factor that goes hand-in-hand with affordability is the fact that the design in terms of cost was based on the average per capita income without differentiating between the employed and the non-employed.

URBAN SANITATION

Like its mentioned in the overview,there seems to be a lot of overlapping responsibilities with regard to sanitation implementation within the urban and its peri urban settlements. The facilities range from sewage system to low cost sanitation systems whereby we have organisation involved down to individual householders.

For waterborne systems,water and sewerage authority (WASA) is charged with the full responsibility of operating and maintaining such facilities,and this is done on fair basis. Because of industrialisation which has greatly influenced urbanisation there has been lack of land management where settlements planning and zoning never took off. The major factor which influenced this very important aspect of urbanisation was inadequate policies, and lack of enforcement of available legislation.

Urban Sanitation Improvement Team (USIT) was incepted in order to facilitate low cost sanitation systems within the periurban settlements and to replace bucket system (night soil). This is a project where inadequate data on operation and maintenance is evidenced whereby a lot of machinery that was used in the initial stage is left unrepaired because of lack of funds, expertise and lack of commitment from the central government. Another thing that happened was the staff reduction at a very high rate and a number of them leaving the project for some other jobs resulting in negative capacity building. Latrines are built for individuals and the maintenance part is left in the hands of householders who in turn uses the facility without even maintaining it or replacing worn out pacts/components.

Its worth mentioning here again that other organisations like LEHCOP - Lower Income Housing Cooperation got highly involved in the facilitating of latrines but honestly when viewed in a wide spectrum certain aspects should have been taken into consideration before the project was started. This really refers to the provision of numerous VIP latrines which could have been replaced by public sewers because emptying out such facilities is a real problem.

Retailers are also playing a major role in selling latrine superstructures which to some extent are not up to the National standard and the main course of this is lack of policy guidelines hence certain standard specifications are not met.

Maseru City Council (MCC) being the mother body taking care of all the urban activities has little to offer except to direct affected organisations to undertake controlling measures. The key responsibility it has is the collection and disposal of refuse within its jurisdiction; but because of urbanization and industrialization the production of solid wastes has become so high that the council cannot cope with the load. Besides the fact that now people are health conscious,there have been quite a number of typhoid cases within the urban settlements but cases were very sporadic and the presentation in general was very low. Because of the reasons mentioned on case presentation the formulated hypothesis (after visiting affected areas and facilities) blamed the whole situation on lack of personal and environmental hygiene which is also greatly influenced by lack of hygiene education.

The final recommendation under the urban sanitation operation and maintenance,would be to equip the city council with full responsibility and whatever financial assistance is provided should go through this council.

RURAL SANITATION

History reveals that individual householders built latrines after the massive campaign undertaken by the Environmental section of the Ministry of Health and Social Welfare. A linked expertise was introduced to retailers by health assistants on the making of latrine superstructures which were in turn sold to the communities and really this was a very good start on rural sanitation. We have quite a number of organisations involved in sanitation but because of lack of policy guidelines such organisations do not consult NRSP hence the programme's implementation strategies are overlooked.To mention a few:-

(a) National Rural Sanitation Project
(b) GRASSROOTS Initiated Support (GRISP)
(c) CARE LESOTHO
(d) PLENTY CANADA
(e) WORLD VISION
(f) ISRP (School latrines)

Conflicts that arouse within the communities are basically on the fact that implementation strategies differ from one organisation to another i.e some introduce subsidy schemes whereas others stress community participation concept whereby the family has to bear 100% cost of construction.

RURAL SANITATION PILOT PROJECT

This pilot project was started in Mohales Hoek in October 1993 by the GOL WITH support from UNICEF, UNDP, USAID and IBRD. Implementation of RSPP was conducted jointly by the MOH and MICARD and technical assistance for the project has been executed by the former Technology Advisory Group (TAG) of the World Bank.

RSPP was set to design-test and develop institutional capacity for rural sanitation programme that would be integrated with rural water supply and primary health care programmes. The main objectives of the RSPP, as outlined in the Third Five Year Development Plan and the Third Country Programme was to establish a strategy for an integrated district - based National R.S.P., which would lead to a sustainable improvement in the health status of the low-income rural population. This improvement would be achieved by expanding and creating additional rural sanitation infrastructure and related educational services. The strategy adopted was chosen to maximize the use of the existing manpower, institutions of the GOL and the beneficiary communities by promoting systems through which rural people could built, use and maintain sanitation facilities in a self-sufficient and self-sustained manner. The pilot project ended in December 1986 and at this point the NRSP was launched.

Since then there have been a great influx of donor funding to nine districts of Lesotho leaving only one unfunded. The phasing out of donor funding to certain districts has left the projects stranded in regards to finance, transportation and personnel hence having a negative impact on sustainable progress and capacity building. Generally lack of commitment shown by the Government has greatly affected the sustainability of NRSP because majority of aspects in the projects documents are never fulfilled.

This is one project whereby a lot of success was seen within the country because through its promotional activities and campaigns a lot of sanitary facilities came into being even at places where the infrastructures were not already set.

The programme organisational structure is set up such that operation and maintenance is carried out at various levels i.e from project administrators to beneficiaries. This is true because of the involvement of communities in setting up their own programmes with the help of extension personnel based at grassroots levels. Information, Education and Communication (I.E.C.) Concept is one of the basic tools the programme has set up and its sustainability lies with project implementors as well as community health workers.

Trying to address the economic status of the communities the programme aims at training local latrine builders and this plays a major role in contribution to rural employment and income generation.

GENERAL INFORMATION

The Kingdom of Lesotho is an independent country of a size of 30'355 sq.km in area and it is totally surrounded by the Republic of South Africa(RSA). Lesotho is proportionally 75% mountainous and 25% lowlands, where most of crop farming is made.

Lesotho has a temperate climate with four well marked seasons. The temperatures can drop to a point below freezing in Winter and can rise up to 36°C. The rainfall is seasonal, under normal circumstances, with annual average of 700mm and most of it falling from October to April.

The population of Lesotho is currently estimated at 1.8 million. From this total population 85% live in the rural areas, while 15% live in the urban centres and towns.

The urban people do survive through jobs in the centres where they live while rural people are mostly living through, both stock and crop farming. Rural income is generated mainly by working in the mines of RSA and this income has been very much affected, over the past years when World sanctions applied to RSA started biting. Statistics shows that around 1974 there were about 174'000 mine workers and in 1991 there were only 95'000 mine workers remaining.

WATER SUPPLY SECTOR

There are two organizations dealing with water supplies in Lesotho.

URBAN WATER SUPPLY

Water and Sewerage Authority(WASA) is responsible for services in the urban areas

-see the attached brief as provided by WASA management on their operations.

RURAL WATER SUPPLY

VILLAGE WATER SUPPLY SECTION(VWSS) is the Governmental organization responsible for water supply services in the rural communities. But there are other Non-Governmental Organizations(NGOs) which are providing water supplies to certain villages, especially, handpumps. With some NGOs there has been little or no coordination with VWSS on their activities.

VILLAGE WATER SUPPLY SECTION

Background

The section was first established in the late 1960's after independence as part of technical services under community development department. It was then a small section operating from the capital for services all over the country. The department had also a section dealing extension services, to inform communities on availablity of community Governmental services. VWSS relied very much on this section for its operations on rural areas.

VWSS improved over the years, with the first expatriate contact in the late 1970's. The expatriate helped in developing constructional standards and specifications on constructional methods. The results were that of high quality water supply systems.

In 1981, at the beginning of water decade, big donation started flowing into the water supply section. VWSS therefore grew rapidly, interms of organizational structure and infrastructure. All the ten districts had well equipped offices by mid eighties. This meant that more and more water supplies were constructed all over the country. It is now estimated that 51% of rural population have access to improved water supply systems.

The structure of VWSS had been construction orientated. More emphasis and support by donors had been on construction of water supply systems. Donor agents attached to VWSS were more interested in increased served population. The interest let to a point where NGOs were supplied with material, especially handpumps, to construct systems. Many handpumps with insufficient record were installed on many lowlands villages.

Operation and Maintenance

Operations of rural systems is left to the communities while maintenance has been Governmental responsibility. The approach used by VWSS when constructing systems is that communities provide only unskilled labour requirement for construction of a system. They are asked to apply for water supply, form a village water supply committee(VWC) and to as well contribute money which they have to keep in their bank account. "Bylaws" which are meant to govern the system are to be formed by individual community. The cash contribution is to be used to pay for any future maintenance requirements.

When systems are completed they are left to the communities to operate and do all minor repair works which can be handled by the trained village waterminders. Major repairs are to be reported to the district offices for attendance by the district maintenance crews. These repairs carried by maintenance crews were free at the beginning but as frequency on system maintenance increased, especially, on handpums a cost recovery policy was introduced.

Cost recovery policy is meant to recover only up to 50% of the repair costs. It states that all repair works carried on systems which are more than one year old will partly be paid for, by the communities. The maximum amount to be paid by a community is equal to the total population multiplied by one Maloti. Communities are given 90 days to settle their issued invoice, falling which sanctions would be applied on any further maintenance requirement.

There has been problems in implementing the policy, especially when sanctions had to be applied, then the question of village water supply ownership surfaced. VWSS had invested a lot of money in building the system, would it therefore be wise to stand aside and look at systems deteriorating and not serving its purpose? The answer has been NO.

Investigations were carried out and some important observations made were that, at village level the "Bylaws" made by communities could not be lawfully enforced since they are not covered by any legislation. The problem is still an issue to be addressed by politicians.

At VWSS level it was observed that there was a shortcoming on information dissemination, so much that a lot of communities were still ignorant on their roles and responsibilities on water supply systems management. The problem is now being tackled by an introduction of a new unit within VWSS of village affairs. The unit is to provide support through Village Liaison officers, who are to link the communities directly with VWSS on water supply related matters. The level of success is yet to be seen.

Generally it could be said that it is now starting to be realized that Government alone would cope with rural water supply maintenance. It is apparent now and even more so in future as % coverage increase. A support is needed.

Prepared by,

T.W. Sepamo
District Engineer,
VWSS-Thaba-Tseka.

5th November,1993.

TITLE: **STRENGTHENING PROGRAMS FOR DRINKING WATER AND SANITATION IN NAMIBIA**

DIVISION: **(WATER AND SANITATION) PUBLIC HYGIENE**

Mr C. A. TITUS

REPRESENTATIVE: ~~**MR. ASHIPALA**~~ mr F. Amulungu

LOCATION: **NAMIBIA**

DURATION:

SITUATION ANALYSIS

The Plan of Action for Namibia to attain the goal of Health for all by the Year 2000, as a minimum gaol of social equity, requires access to clean drinking water and includes sanitation for 100 % of the population by the year 2000. The goal of this plan is to reach the greatest coverage possible. The provision of safe water is one of the most important measures for prevention of diarrhoeal and numerous other water-borne and facial-borne diseases. Improvement of sanitation is also of prime importance in the control of dysentery, cholera, typhoid etc.

By 1990, the results of survey by UNICEF of water supply availability and sanitation situation indicated that 95.2 % of the population in the rural North have no toilet and it takes 102 minutes to get water source during dry season.

	Water in or outside Home (%)	No Toilet (%)	Minutes to dry season water source
Katutura	100.0	0.2	1
Peri-urban North	85.2	74.2	11
Rural North	50.1	95.2	102
All Regions	72.4	61.6	53

(Original Source: Household Health and Nutrition survey, UNICEF September 1990)
(Reproduced from Situation Analysis on Children and Women in Namibia)

The situation analysis report maintained that in the northern area of Namibia, people share water points with animals and most of these points are surrounded by sand and dust and largely polluted.

The 1990 UNDP sponsored water and sanitation review revealed that only about 60 % of Namibian's total population had access to safe water supplies through boreholes. In drought affected country like Namibia, there are seasons of severe water shortage, and even when water is available, it is often not portable. Overall assessment shows that the coverage is below acceptable norms and unsatisfactory. The improvement of both water and sanitation calls for considerable investments.

To reach the national goals, it will be necessary to supply many inhabitants with portable drinking water and to provide sanitation services to majority, giving priority to the marginal urban and rural populations as an integral part of Primary Health Care.

However, achieving these goals means not only the construction of new drinking water systems and sanitation, but also the proper organization and development of the institutions responsible for their management, operation, and maintenance, as well as the effective participation of the community in the solution of their problems.

National assessments concluded that the managerial and operational capacity requires strengthening to translate national plans into the effective provision of drinking water and sanitation services.

The principal limitations hindering accelerated development in this sub-sector are:

* Financial Limitations
* Restrictions on Imports
* Inadequate systems for the recovery of Costs
* Shortcomings in the operation, maintenance, and intermittent service of water supply
* Insufficient knowledge of the availability of water resources and the limited quantity of the same
* Insufficient trained personnel at both the professional and technical levels
* Use of inappropriate technology
* Insufficient health education and limited community participation

With the view of overcoming these constraints, a need assessment evaluation for technical assistance includes rehabilitation and constructions of more boreholes, development of institutions and human resources in both the diagnostic and formulation of solutions and their implementation, training programmes for environmental health assistants, the provision of materials and equipments for demonstration latrines, research and dissemination of appropriate technology, community participation, establishment of community health education program on sanitation and research on water resources and water quality, mainly.

The population covered by this project would provide thousands inhabitants with drinking water and thousands with sanitation, thus ~~covering % with water and % with sanitation~~.

OBJECTIVES

GENERAL

The overall gaol of this proposal is to develop the necessary infrastructure for the extension of coverage and optimization of the installed capacity. This will include the physical economic, financial, institutional, human resource aspects and appropriate technology, to provide the sub-sector with negotiating tools for the mobilization of national and international resources. The following specific goals are proposed:

SPECIFIC: GOALS

(a) To develop the managerial, technical and operational capacity of the institutions responsible for the execution of the investments and the operation, maintenance, and management of the systems.

(b) To formulate and develop national financing and tariff mechanism systems oriented to the channelling of resources to the sector within the framework of economic efficiency, social equity, and financial and institutional autonomy of the entities of the sector.

(c) To implement the information systems necessary for the monitoring and evaluation of Plan of Water for all Namibians and to support the decision-making processes at the national level and at the level of each institution.

(d) To identify, promote and transfer appropriate and low-cost technologies and design criteria for drinking water and rural sanitation and for medium-sized and small cities.

(e) To optimize the execution of the rural projects with emphasis on the scattered population, as well as on peri-urban areas through the strategies of Primary Health Care,with particular attention to community participation.

(f) To train the professional, technical, auxiliary and community personnel required for the attainment of the goals.

TARGET OUTPUT

The beneficiaries of this project will largely be the majority of marginal rural inhabitants particularly the low-income group who have little or no access to the portable water supply and hygienic sanitation conditions.

With successful implementation of this project, a drastic reduction in the number of cases of water-borne diseases is expected as an outcome. This would facilitate the achievement of health for all Namibians through the Primary Health Care approach.

PROGRAMME MONITORING AND EVALUATION

Successful implementation of community maintainable water supply and sanitation project demands the establishment of an effective Monitoring and Evaluation team. At the central level, a Monitoring and Evaluation team would be created in the water and sanitation division to facilitate periodic follow-up and support services and the streamling of disaggregate information from the Region, the districts and the community.

Since the water and sanitation programme has its implementation base at the district level, a monitoring and evaluation team will also be set up for routine data collection, analysis and feedback to community. The indicator for water component would be the percentage of the population living within 200 metres of source of portable water. The indicator for the sanitation component would be percentage of population living within 50 metres of a pit latrine/toilet. The coverage survey and the monitoring forms on environmental activities will indicate the number of household with latrine. The effectiveness of the health education would be tested by the degree of improvement in personal hygiene and environmental sanitation. The monthly and annual record of environmental health at the district and the health unit will provide additional routine data.

There will also be community water committee at the community level to provide backstopping support and monitoring of maintenance and repair and financial contribution to construction.

PLAN OF ACTION

ACTIVITIES	TIME	ACTORS	MONITORING INDICATORS	LINKAGES	RESOURCES	COST	TARGET
Setting up community water committee and appointment of community members who will be entrusted with operation and maintenance	June 1992 November 1992	Health Inspectors & Environmental Health Assistants	Committee Setup and members appointed	Ministry of Rural Development Ministry of Land and Resettlement	S + T, Accommodation, Fuel	R 18500-00	Caprivi Ovambo Kavango Bushmanland Opuwo Hereroland
Training of the appointed community members in the maintenance and repair of facilities and in simple accounting procedures	September 1992 November 1992	Health Inspectors & Environmental Health Assistants	Attendance and participation	Ministry of Water and Rural Development Ministry of Land and Resettlement	Perdiem S + T, Accommodation and Fuel	R 30000-00	Communities in the Caprivi Ovambo Kavango Opuwo Bushmanland
Performance-related training and human resources development within the institutional structure	July 1992	Health Inspector 2/Two	Report from Study tour	Ministry of Water and Rural Development Ministry of Land and Resettlement	Malawi-Botswana 3500 Airfare plus accommodation per person and S + T	R 11500-00	Visit Malawi Botswana study tour V.I.P. toilets
Construction and rehabilitation of boreholes for safe water supplies	August 1992 March 1993	Health Inspectors and Environmental Health Assistants and the community water committee	Monthly/Annual Environmental Record Construction accomplished	Ministry of Water and Rural Development Ministry of Land and Resettlement	80 Boreholes Hand pumps	R 25500-00	80 Boreholes Hand pumps
Construction of affordable or site facilities for excreta disposal	June 1992 March 1992	Health Inspectors and Environmental Health Assistants	Monthly/Annual Environmental record Construction accomplished	Ministry of Water and Rural Development Ministry of Land and Resettlement	120 Toilets S + T and Fuel	R 166000-00 R 19000-00	120 Toilets 15 Toilets in every pilot district
					TOTAL	R 500000-00	

SUSTAINABILITY

Sustainability within the context of this project provides for a strong sense of community involvement and ownership as well as community-bases operation and management systems that function.
Apart from community involvement in the planning and decision-making process, commitment will be expected to be demonstrated before project construction activities are commenced.

In addition, technology would be suited to local needs, conditions and resources in order to provide for financial responsibility in terms of cash, kind or labour.

Government is committed to provide on a grant basis the investment cost for the development and improvement of facilities in addition to contributions from the community. It will also set-up the necessary support structures in form provision of affordable spare parts supplies, technical advice and quality monitoring.

C. A. TITUS
F. AMULUNGU

PRESENTATION: ~~C.H. ASPARA - ASHIPALA~~
~~HEAD:~~ PUBLIC HYGIENE

SANITATION AND WATER NEEDS

Background:

Namibia is a country with semi-arid climatic conditions. 70 % of its population of just over 1.4 million is sparsely distributed over its 824,269 sq kilometers, with only 30 % of the population urbanized, 1/3 of the urban population lives in the capital Windhoek, more than 60 % of the total population live in the northern parts of the country. The annual rainfall exceeds not 250 mm and ranges from 20 mm in the Namib desert in the West to 600 mm and more in the North Eastern part of Caprivi.

Piped water is still found in fairly sufficient supply in all towns. Outside the towns, river or borewhole water is used for human consumption, often without any further parification. Many of these water points are highly polluted especially in the Northern parts of the country where people share them with animals.

In correlation with the poor water situation, unsatisfactory sanitary conditions can be stated, especially in the rural areas. 95 % of the rural population in the North were without toilet facilities.

Due to the above stated shortages diarrhoea especially among children under five years of age, resolves as one major cause of morbidity and mortality in Namibia.
Because of the magnitude of the diarrhoeal problem the Environmental Health unit envisage to promote the construction of V.I.P. latrines in coorporation with the community, at this stage at least demonstration latrines to create awareness among the population in need.

A monitoring and evaluation team would be created to facilitate periodic follow-up and support services. Our target is to build 80 V.I.P. toilets. The Health Inspectors and the Environmental Health Assistants will built the toilets they will be the Actors and Committee will be the indicators.

Nigeria

10 cpys

EXECUTIVE SUMMARY.

Water and sanitation (W&S) dominates the life of many people in the world's less developed countries. This is especially true in Africa where it will remain a challenging issue for a long time to come. Availability, use and misuse are problems with answers. The real problem is the competition for attention and funding with political and economic challenges. Unpredictable population growth makes the marginal increase of served populace seemingly insignificant. Regular outbreaks of cholera and other W&S relates diseases have confused,complicated and reinforced matters. However it should be realized that health is an essential objective of development. The capacity to develop is itself dependent on health which W&S provides as an essential infrastructure. Health status should not be traded off against economic and political gains. It should be realized that emphasis,in this case,is now on water for health. It means potable water for drinking, sufficient water for bathing, personal use and food hygiene. Safe water is dependent on proper and safe excreta and refuse disposal. The situation with sanitation is unacceptably deteriorating and it is not receiving due attention.

Operation has to do with proper design of project document or plan of action with all concerned. Maintenance has to do with involving the consumers in everything including operation, consolidation, replication and sustenance. Maintenance has to

do with ability to pay. Ability to pay has to do with income generating capacity. It has to do with appreciation of why payment is necessary.

Federal Ministry of Health and Social Services, Lagos , Nigeria was involved in rural W&S project implementation with UNDP funding and the World Bank execution. The "pains and gains" on the project are also treated and presented as a case study. Projects should be inspired by the recipient country. The project document should be prepared by the country or the country should be fully involved in the preparation of it. Donors should encourage and assist nationals to be incharge of projects. This will go a long way to build and strengthen national ability and self reliance. Prompt payment of Government Counterpart Contribution is very important to proper and timely execution of projects or programs. The project or program should be able to function without or with minimal routine civil service constraints. If Donor activities are co-ordinated by each country and their resource inputs are maximally and prudently managed, a steady progress to serve more people at cost value could be achieved.

WORKSHOP ON OPERATION AND MAINTENANCE OF RURAL AND URBAN WATER SUPPLY SYSTEMS ORGANIZED BY THE WORLD HEALTH ORGANIZATION (WHO) IN COLLABORATION WITH THE GOVERNMENT OF ZIMBABWE HELD FROM 8TH - 12TH NOVEMBER, 1993 AT HARARE.

NIGERIA CASE STUDY PRESENTED BY M. O. IDOWU OF FEDERAL MINISTRY OF HEALTH AND SOCIAL SERVICES, NIGERIA.

1. General Introduction

Water and Sanitation are two separate subjects. They are complementary. For the purpose of this presentation, they will be treated together. Sanitation when paired with water, has a narrow and restricted definition and application. It could mean proper and satisfactory disposal of wastes (excreta and refuse), personal and food hygiene. Water without sanitation gives a picture nearer to the real situation obtained and practiced in some developing societies. Water and Sanitation is the ideal.

2. Nigeria

For all practical purposes including planning, a population figure of 88.5 million is being used. Preliminary result from the National Census of 1991 released the figure. Over 50% of the population live in rural communities of about 5,000 population size. Agriculture and life stock rearing are the main economic activities of the rural population.

From the epidemiology of diseases available, major causes of ill health, in relation to water and sanitation are gastrointestinal diseases, malaria, guinea worm, Onchocerciasis, Bilharziasis, cholera, etc. It is well known in medical cycles that Nigeria has one of the world highest figures in respect of the disease. Except for cholera, significant reduction had been achieved in respect of guinea worm. FMH&SS has instituted several control measures towards prevention of Onchocerciasis and Bilharziasis.

3. Water Sources

Comparatively, Nigeria is above average in the resources of surface and underground water. In the far south the average rainfall is about 3,000mm/year occurring over seven months (March through October). In the extreme north the average is about 500mm/year occurring over five months (April through September). Rivers, Niger and Benue are major. These and their tributaries drain half the land area of the country. Rain harvesting is an abundant potential area not yet explored.

From studies, about 60% of the country is underlain by crystalline rocks, 20% consolidated sedimentary materials, 20% unconsolidated sedimentary materials. Static water levels range between zero in parts of the coastal alluvium to 200 meters in some sedimentary areas. In crystalline rock areas found throughout the North, well yields are unpredictable. Geology map of Nigeria is attached.

4. Agencies involved in Water Supply and Sanitation

Water supply and sanitation is a matter which the three tiers of Government can operate and successfully maintain. Among the agencies at the Federal level is the Federal Ministry of Health and Social Services. The Federal Ministry of Water Resources and Rural Development has a primary responsibility in both the rural and urban areas. It directs policy matters, plans, co-ordinates monitors and evaluates.

5. FMH&SS Functions

a) It is primarily involved in rural water supply implementation.

b) It focuses attention on health promotion through control and prevention of water and sanitation related diseases.

c) It serves as external verifier to urban and rural water sources and treatment of water to ensure its quality. With modifications, WHO quality control standard and guidelines are used. This responsibility covers both urban and rural water supply.

d) It appreciates "demand driven" approach by some agencies but it pursues and emphasizes health conditionality.

e) It believes in health as an essential objective of development. The capacity to develop is in itself dependent on health. Health status cannot be traded for economic gains. The protection of health and the improvement of health status must therefore become essential conditions for development and socio-economic policy.

f) It pursues provision of safe water for drinking, enough to maintain personal hygiene and hygienic food preparation.

g) It provides safe water and adequate sanitation as a priority need to disease endemic areas and a condition without political considerations.

h) It acknowledges that water can be a friend and an enemy at the same time. It is a friend when it promotes health. It is an enemy when waste water is mismanaged and gives rise to mosquito breeding which in turn gives rise to malaria disease.

i) It understands "cost recovery" situation and implications but practices only "cost sharing" for now. A healthy community could only be meaningfully involved in cost recovery.

j) That W&S has about 70% software component i.e. training, health education, community involvement, women in development and 30% hardware i.'e. borehole drilling, etc. That the ministry has all the software requirements know how. It also has drilling rigs.

The above should form part of the Ministry W&S implementation guidelines when it is formed.

6. Sanitation

It is a primary functionality of the three tiers of Government. In this case, the FMH&SS has policy responsibility. This constitutional responsibility is considerably blurred at the Federal level.' It is being effectively implemented at State level by Ministries of Health. Construction of and use of Ventilated Improved Pit latrines were considered as appropriate

and affordable technology to the communities.

7. Water and Sanitation Situation

Increased efforts are being made to serve more people in urban and rural areas. There are no dependable statistical data to quote from but everyone is aware that the Directorate of Food, Roads and Rural Infrastructures has achieved a measure of successes. Efforts are also in progress to rehabilitate townships water works through loans from the World Bank. The FMH&SS in collaboration with External Donor Agencies e.g. UNDP/WB, UNICEF, CIDA, WHO, etc. is involved in supplying potable water supply and safe sanitation to rural communities especially to those with water related diseases. The exact population being served is not known, therefore, it is difficult to quantify in percentage the degree of population being served.

8. Water, Sanitation and Epidemics

Cholera epidemic is a good case of a disease which implicates water, sanitation, personal and food hygiene. It also has international health travel significance. Regular outbreak is a regular feature in Nigeria. In order to effect control measures, Rapid Assessment Exercise of endemic communities are now being carried out by the FMH&SS with technical assistance and funding by the WHO. The aim is to focus attention on water supply and basic sanitation to the endemic communities. This may look like a vertical control program but it is also horizontal. In the process of specific cholera control measures, picture is emerging that the same communities are having guinea worm,

Onchocerciasis, Bilharziasis, etc. While cholera control through water, sanitation, personal and food hygiene is an entry to the affected communities, a well organized program would have covered other diseases.

Already, Nigeria has recorded about 70% reduction from over 650,000 cases in 1988 to less than 70% from over 650,000 cases in 1988 to less than 200,000 in 1992. The significant achievement must be due to clinical and health education intervention. Water and sanitation is yet to be introduced as a deliberate policy of intervention. A longer time and more funding may be required for the remaining 30%.

9. Follow-up on Water Decade

The Decade period covered 1981 - 1990. With WHO co-operation FMH&SS played a major role in the Rapid Assessment Exercise. More than anything else, the Decade helped to create awareness and implications involved in the negligence of basic primary needs such as water and sanitation. There was Global Consultation on Safe Water and Sanitation for the 1990s meeting in New Delhi, India in 1990. The FMH&SS attended and made significant contribution. There was another follow up meeting in Oslo, Norway in 1992. These meetings recognized and appreciated that the right conditions for accelerated progress will often involve profound institutional, economic and social changes, as well as reallocation of resources and responsibilities at all levels. Looking back today, one may not, in all seriousness and sincerity admit that the right economic and social changes

expected are emerging. The target period of 1981 - 90 had come and gone. "Safe Water 2000" which followed is almost half way through with the attendant results. The vulnerable and disadvantaged people in W&S are not faring appreciably better. Structural Adjustment Program (SAP) effect and infant mortality rate are not good indicators.

CASE STUDY.

1. Basic Information

Project Title: Rural Water Supply and Sanitation (RUSAFIYA) Project

Project Objectives: The immediate objectives of the project are as follows:

a) To develop an LGA and community-based institutional model for the planning and implementation of rural water supply and sanitation with particular emphasis on the role of women.

b) To assist the Federal Capital Territory, Bauchi, Benue, Borno and Plateau States to improve their planning, management and logistical support for rural water supply and sanitation and, in the process achieve project targets of 540 water points and 1,600 demonstration VIP latrines in five LGAs.

c) To provide training for a total of 875 people, including 625 at community level, 200 at LGA level and 50 at State level.

d) To promote and establish an improved policy on ownership and cost recovery for community water supplies and sanitation.

e) To improve personal and environmental hygiene in the project communities.

Other basic information about the project is attached as annex two. Annex three is the expected output. Annex four is actual achievements.

2. The Project Document:

The project operated within a project document. The PD serves as the 'Bible' of the project. It is a binding agreement or document within the law. It was signed by the Government of Nigeria and the UNDP in 1988. A lot of time went into its design before approval. Success or failure of any project is substantially dependent on the operational document which can be seen as a Memorandum of Understanding. However, there is no perfect Project Document. The faith put into the intent and operation is what really matters. To understand the intent or real motive behind a proposal between the giver and the receiver can only be known as things unfold. Full participation of the project recipient country, from the inception of the project will go a long way to reduce any shortcomings on the project. Evaluation and periodic review will also reduce the grey areas.

The RUSAFIYA Project Document (RPD) made provision for 10% time of the Federal (National) Counterpart. At the State level, a State Project Co-ordinator time input was 25%. No project can be sustained effectively with 10% and 25% time of national input.

3. Operation:

The project operated on the Document prepared by the WB without any input from the implementing Ministry. After one year of field operation, the document was reviewed. This was to revise the cash contribution by the country. The national counterpart seized this opportunity to review the project operation and management as contained in the Document. His

recommendations were approved by the Honorable Minister of Health in February, 1989. The project was judged to be poor in operation and management.

4. Maintenance:

There was maintenance, education and training conducted among the communities. It was more of novelty when it should have been acquired and practiced culture. For the first two years of the project, there were insignificant number of water points. Maintenance theory is not the same as learning from physical things in place. Maintenance culture becomes self selling and attractive in a community when they can see, in place, what they have long wished to have. Anxiety to learn and inquisitiveness involved will decline when there is too much gap between mobilization, motivation, health education, etc. of such software and physical operation and achievement of the hardware. Health education on personal hygiene has relative meaning and understanding when water as an essential tool of interpretation is available. Maintenance skill and acquisition of it by training is an ongoing and an interface from active operation period to when such facilities are being used. It has a bearing to availability and affordability of spare parts. More importantly, preventive maintenance is crucial and cost saving and effective.

5. Project Evaluation First Tripartite Review Meeting:

The Tripartite Body was composed of the Federal Ministry of Finance (Chairman), FMH&SS, the World Bank, UNDP, the five

benefitting States and five LGAs. The meeting was held in March, 1990 at the project base in Jos, Plateau State. Among other observations, decisions and recommendations taken were:-

a) The operation of the project was considered to require updating in some respects.

b) Management position was to be reviewed.

Finally the meeting agreed that the project should be reviewed by an Independent Indepth Evaluation Team. The Director, Disease Control and International Health, the UNDP Deputy Resident Representative were at the meeting. It was at this meeting that a decision was taken that the part time National Counterpart should be full time.

6. Project Evaluation: Independent Indepth Evaluation Team:

The expert Team was composed of a Nigerian Water Engineer, a retired Director of NEPA Operation, UNDP was represented by a Consultant Water Engineer from New York, the WB was represented by a Water Engineer Consultant from Washington and Netherlands was represented by a lady economist. They were on the project from late October to 21st November, 1990. The team made the following observations among others:-

a) The project was highly successful in terms of its objectives at LGA and community levels and it has to its credit many accomplishments.

b) The project existed outside of the structure of Government.

c) The institutional relationships between the project and Government are loosely defined in the Project Document.

d) Defined roles of national counterparts especially the Federal Counterpart Co-ordinator, and their relationships to project staff (WB staff) and their home agencies, are weak and do not contribute to their growth and strengthening of their planning and management capabilities or technical background.

There was no follow up of the report and therefore no significant impact.

7. Other follow-up Reports:

The Nigeria member of the Indepth Evaluation Team prepared a separate report. He personally presented it to the Ministry. He broadly associated himself with the conclusions of the Team. He observed that cost recovery issue as pursued by the project will be very tenuous. He also observed that the project was designed to be handed over to Nigeria as a finished product or 'turnkey'. He strongly recommended of national active participation.

Second Tripartite Meeting also followed in 1991. Two Federal Project Advisory Committee meetings were held in 1991 and 1992. The conclusions from various committee meetings were identical to others and pointed to the same direction.

8. Terminal Tripartite Review Meeting:

It was held on 27th October, 1992. The Federal Ministry of Finance Deputy Director chaired the meeting. Among other decisions taken were:-

a) The achievements of the project were reviewed and the general view is that the concept of the project was valid and still relevant but its implementation has achieved less than 50% of the planned outputs due to a number of logistic and operational problems and the poor management of the project.

b) The progress and achievements of the project were regarded as unsatisfactory due to design and implementation of the project.

c) Future design for projects in the Water and Sanitation sub sector should take into consideration the lessons learned to ensure greater participation of States and Local Governments and that State and Local Governments participation in the project should be "health driven".

9. Project Executor Comment in October, 1992:

"It has a design problem right from the start. It was not feasible to set up a management structure at the State level to implement the project because the project was too small to justify the cost involved. Although this problem was noted throughout the project, it was not possible to change the management structure in the middle of the project." One would expect a project document to accommodate changes of this nature and to effect such changes at any time. Overhead costs affect the size and quality of physical outputs.

10. Comments:

a) Project should be handled in such a way it is operated with little or no time extension. Long time extension is usually not cost saving.

b) It must be seen that evaluation reports are followed up to rectify shortcomings.

c) Communities must be mobilized up to the point you can meet their needs. Maintenance must be an acquired culture and sustained.

11. Experience gained from the Project:

These are from 20 months attachment to the project.

a) A recipient country should originate projects in accordance with their considered priorities.

b) Donor originated projects should be carefully examined by recipient country to ensure that they are a priority and there is a will to sustain at the end of Donor activities.

c) Recipient country should try to keep project staff on the project and avoid rapid changes so as to keep and sustain experience.

d) Recipient countries should ensure that their matching funds are procured up front to avoid future delay in getting them.

e) Recipient countries should ensure an efficient implementation machinery in order to achieve the objectives of the project.

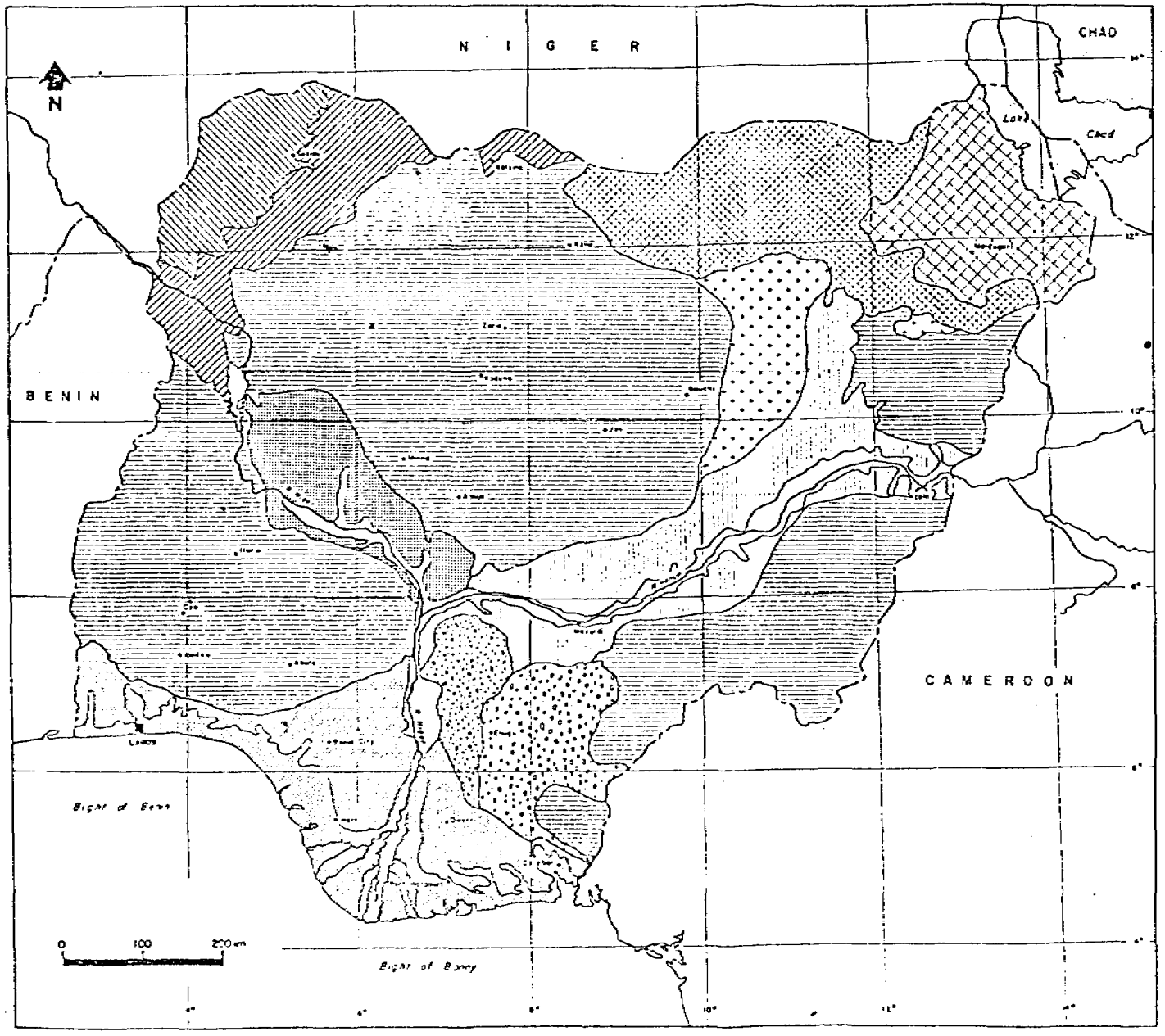
f) Each country should have a policy on implementation guidelines and ensure that Donors work within it.

g) Preventive maintenance should be highly encouraged to reduce high cost that will be spent during breakdown of equipment.

h) The Legal Department of the Ministry must always be involved in the preparation and finalization of any project document.

12. Conclusion:

The provision of potable water for health and safe sanitation for the majority of people in developing countries will result in far reaching improvement in the health of the people than high tech-medicine. Developing communities should regard W&S as their first priority and Donor countries should encourage these by always responding to requests in this sector.



NOTES

- Coastal alluvium mangrove and fresh water swamps
- River course alluvium
- Coastal sedimentary lowlands
- Chad Basin (Confined Aquifer)
- Chad Basin (Unconfined Aquifer)
- Keri – Keri Sandstone
- Sokoto Basin (Tertiary)
- Sokoto Basin (Cretaceous)
- Nupe Sandstone of the Niger Basin
- Anambra Basin
- Cross River Basin
- Benue Basin
- Crystalline Area

ANNEX ONE
MAP OF GROUNDWATER PROVINCES

SOURCE : NATIONAL ATLAS OF THE FEDERAL REPUBLIC OF NIGERIA, 1ST ED., 1978

ANNEX TWO

Basic information

Project Title: Rural Water Supply and Sanitation (RUSAFIYA)

Project Function: Direct Project Support and Installation Building at State and Local Government Levels.

Secondary Function: Institution building at Federal level.

Sector: Disease Prevention and Control.

Government/Implementing Agency: Federal Ministry of Health.

Executing Agency: The World Bank.

Estimate Starting Date: January, 1988; actual: September, 1988.

Project Site:

Plateau State		(Nasarawa LGA)
Bauchi	"	(Ningi LGA)
Borno	"	(Gwoza LGA)
Benue	"	(Oju LGA)
FCT,Abuja		(Gwagwalada)

Duration: 36 months

In Kind Naira: 1,020,960

In Cash Naira: 8,839,800

UNDP inputs in Dollars: 3,130,727

Netherlands Government US797,244

Comment: Water supply to Oju LGA was later changed to mini piped system. The piped system was later referred to borehole because of low yield of ground water aquifers. It was allowed to finish by October, 1993. Less than 50% had been achieved in October, 1993.

Annex Three

Expected Outputs:

The following physical facilities were to be provided during the duration of the project:-

State	Machine Drilled Boreholes	Hand Drilled Boreholes	Hand Dug Wells	Demons-trated VIP (Latrines)	People Served
Bauchi	80	-	60	400	42,000
Benue	45	30	25	300	30,000
Borno	75	-	25	300	30,000
Plateau	30	45	25	300	30,000
FCT,Abuja	45	30	25	300	30,000
Total	275	105	160	1,600	162,000

This table assumes that each water point serves 300 people.

Comment: These are physical outputs expected after a revision of the original Project Document. The amount involved to be paid were reduced so also were the number of physical targets reduced. However, the original time of 36 months to accomplish the target was not reduced.

Annex Four

Actual Achievement:

LGA	AS PER REVISED PROJECT DOCUMENT			ACHIEVED AT END OF PROJECT			HAND PUMP INSTALLED
	BHs	HDWs	VIPs	BHs	HDWs	VIPs	
Bauchi	80	22	250	80	14	123	41
Benue	-	-	-	5	5	38	4
Borno	53	12	144	59	8	46	42
Plateau	31	25	235	32	20	120	42
FCT,Abuja	40	15	195	44	10	110	54
Total	204	74	824	220	57	437	183

Comment: The figures given were achieved after two times extension of the project. Arrangements are in progress in October, 1993 to fix 81 head pumps. Durability and reliability of the pumps and maintenance after a period of use will require sometimes to assess. Usually, the number of pump users are less in the rainy season. Some communities are more concerned about ensuring proper use than the other. Some extension agents are working among the communities re-educating them of how to carry out preventive maintenance.

A COUNTRY POSITION PAPER ON THE WATER SECTOR IN MALAWI (- OPERATION AND MAINTENANCE OF RURAL AND URBAN WATER SUPPLY SYSTEMS

AND

OVERVIEW OF HEALTH EDUCATION AND SANITATION PROGRAMME - HESP - IN MALAWI

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A paper presented at the "Subregional Workshop on Operation and Maintenance of Rural and Urban Water Supply and Sanitation Systems" HARARE, 8 - 12 November, 1993

Malawis' National Policy on Rural Groundwater supplies is to provide adequate potable water through the construction of boreholes and shallow wells that are handed over to the user communities and operate through a VILLAGE LEVEL OPERATION AND MAINTENANCE SYSTEM. This system ensures reduction in maintenance costs borne by government.

In 1981/2 the department initiated a programme of Integrated Projects for Rural Groundwater Supplies. The approach was based on a high degree of community involvement in both construction and maintenance of the facilities. Such integrated projects included the Luvulezi Groundwater project in Central Malawi, Lilongwe North East, Dowa West project and the Karonga groundwater project (Fig.3). A national workshop on strategies for operation and maintenance of Rural Groundwater Supplies was held in Malawi in 1986.

The main objectives were to review the findings of the handpump testing and maintenance monitoring in the Livulezi Project and to discuss the findings in relation to the national rural groundwater supply programmes.

The workshop concluded that self-help was to play a major role in the maintenance of wells and boreholes. The workshops further concluded the need to restructure the then maintenance system. Central government would continue to play a major role in planning and monitoring.

The recommended national procedures and requirements have been drawn-up. Community based management activities can only be successful if facilities are handed over in good condition and that handpumps are suitable for village-level maintenance.

The Malawi Government is todate instituting the VLOM system wherever possible i.e. where conditions are infavour for community based management. New boreholes drilled for rural communities are chiefly equipped with manageable handpumps as the Afridev. Old boreholes are being rehabilitated where funding is available and a manageable handpump installed. User Communities are trained on the repairs. To date the structure to support VLOM activities in Malawi is in place. There is a national and regional level steering committees and the methodology outlining the implementation of VLOM has been developed.

However, despite considerable investment of manpower and financial resources in maintenance, it is estimated that 3,000 to 4,000 pump are out of order at any one time, with severe consequences to the users.

In order to address this problem, Malawi with assistance from the UNDP embarked on a community based management of rural water supplies project in 1989. The main project activities started in 1991. The project was executed by Malawi Government and supported by the UNDP/World Bank Regional water and Sanitation Group based in Nairobi. The project was designed to serve as a pilot project for the main borehole rehabilitation programmes, namely:-

(a) IDA financed borehole rehabilitation programme
(b) UNCDF/UNDP funded borehole rehabilitation project.

The principal objective of the Community Based Management Project was to develop procedures and co-ordinate, monitor and render technical assistance to activities promoting community based management in rural water supplies.

The specific aims of the project included the need to create a special unit within Water Department, to be known as the Rural Water Supply support unit, responsible for project

implementation and the promotion of community based management in rural water supplies.

It also aimed at establishing a community-based rural water supplies management system whereby the user community would contribute towards maintenance cost.

The pilot project also aimed at the institutionalization of procedures and linkages for inter-ministerial collaboration and co-ordination in community water supply development.

It also aimed at rationalizing and standardizing community based management procedures. The pilot project also aimed at standardizing handpumps with VLOM type of pumps.

THE KARONGA INTEGRATED GROUNDWATER PROJECT - A CASE STUDY

One of the project that has achieved a high degree of community involvement is the Karonga groundwater project. The Integrated project approach to groundwater supply in Malawi started with the upper Livulezi project and has since been undertaken in several integrated projects. By involving user communities in project implementation and maintenance considerable improvements in project utilization and maintenance have been achieved.

In 1984, the Government of Malawi requested Danida to finance a new integrated project for rural groundwater supplies in the Karonga Lakeshore area in Northern Malawi. The project was approved and started in 1987, and formulation and introduction of a VLOM system started in October, 1990. The objectives of the project included:

Main objective - To improve the basic living condition of the target population in Karonga Lakeshore area. With the integrated nature of the project, sanitation and Health education were important components following the supply of clean potable water.

Specific Obj -

- To supply potable water through borehole rehabilitation and new well construction.
- To optimize the utilization of groundwater resources within the area
- To provide a low cost solution to the development of groundwater for rural domestic supplies (Vonderigs)
- To introduce and establish a sustainable community based maintenance system (VLOM)

By 31st March 1992, VLOM concept in Karonga started to function, with the communities having a maintenance fund, pump attendants maintaining pumps and government technical assistant able to assist and advise on major repairs only. Spare parts are locally available for purchase and 20% of all households have a latrine with a sanplat.

CONCLUSION

Rural water supplies in Malawi comprise of dug wells, boreholes and gravity fed schemes. The borehole schemes supply over 2 million persons while rural gravity schemes supply over 2 million persons also.

Borehole handpumps have mainly been maintained by mobile units equipped with small trucks at district level. The principal technical problems of poor borehole designs, have resulted in silting of boreholes and accelerated wear of pump components. The borehole handpumps used are difficult and expensive to maintain because they require heavy lifting pumphead.

The Government of Malawi thus, has experienced high maintenance costs that it has not been able to fulfil the population requirements. The total maintenance budget for borehole maintenance for 1993/94 financial year totalled to MK 2.2 only, whilst the realistic worked total requirement was MK 14.0, as per current costs of materials.

The national policy on rural water supplies is thus to provide adequate potable water through construction of boreholes and gravity fed schemes which are handed over to users to operate through VLOM system.

The initiation of integrated projects for the implementation of rural water supply project is now assisting in keeping maintenance costs at low levels, though the national coverage for such a system is still very low.

The government is making sure that the structure to support VLOM system is well placed and that ongoing and future projects, adopt the style. Good experiences have been learnt from the earlier mentioned projects and that refinement of issues related to VLOM system continue to be worked on new

projects. The centralised maintenance system shall still exist to take charge of non VLOM pumps, and government support shall still be required.

- **Urban Water Supply Schemes**

Malawi had its first urban water supply scheme in the early 1950's. There are fifty two such schemes todate catering all districts and townships except cities of Lilongwe and Blantyre who operate their own water boards. Over 363,640 persons are served by these schemes, and over 1 million persons are served by the two water boards (Table 4.0) and (Fig 3.0)

OPERATION AND MAINTENANCE OF RURAL WATER SUPPLY SCHEMES.

- **Rural Piped Water Schemes**

There are 56 gravity - fed rural piped water schemes, serving a total population of over 2.0 million persons (Table 1.0). The schemes are implemented with full participation of the community. The community provides unskilled labour in trench digging, burying of pipes and digging of foundations for storage tanks. The government provides all materials and technical expertise.

The maintenance of the schemes has mainly evolved from experience. The responsibility are clearly set out and explained to the user communities. The communities are responsible for replacement of broken taps, payment for caretakers, and making a repair team committee. The repairs to aprons and washing slabs are responsibility of the user community. The cleaning of sedimentation and storage tanks and of maintenance of treatment works are responsibilities taken by the user communities.

Training features high for these schemes and refresher courses for monitoring assistants and project assistants are undertaken annually. The training courses are supervised by staff from Ministrys' of Health, Community Services and Works - Water Department. The syllabus for these training courses were formulated in 1990.

- Evaluation and monitoring unit for rural piped schemes was established in 1980 with the aim of collecting and analysis of field data. The number of taps working, washouts, condition of tap aprons, number of pipe breakages, lines inspected, are some items looked during the exercise.

  The notion of community participation has been declining over the years, due to reasons mostly related to the social change.

  Encroachment of the catchment areas within intakes is becoming a serious issue. Quality of water tends to deteriorate due to sediments. Slow sand filters are used though they don't deserve the long term solution.

  Vandalism has increased in most schemes rendering user communities an impossibility to repair.

  The number of piped water schemes has increased tremendously for the past few years and that government is not strongly able to support them.

- **Rural Groundwater supply Schemes**

  Drilling of boreholes in Malawi started in the 1930's with a variety of handpumps installed. Most of the maintenance works was a responsibility of the client, but the trend has shifted to increased responsibility left to Central Government.

  Borehole handpumps in Malawi have traditionally been maintained by mobile units equipped with small trucks based at district centres. There are presently over 24 such units. The system has been fairly successful in keeping a reasonable number of handpumps operational. The total costs have escalated and effectiveness in operation has been decreasing over the period.

INTRODUCTION

Malawi is a landlocked state in Southern Africa south of Equator between latitude $9^0 45'$ and $17^0 16'$ south, between longitude 33^0 and 36^0 east. It is nearly an area of 118,485 Km^2. It is bordered to the north by Tanzania, to the east, south and south west by Mozambique and to the west by Zambia. Malawi is dominated by the lake, 568 Km long and occupies part of the Great African Rift Valley (fig 1). The country experiences a Tropical Continental Climate with Savannah Woodland and the red soils dominate. The 1987 defacto population census revealed a population of nearly 9 million people, with an annual population growth rate of 2.7%.

The two main natural water resources come from surface water and groundwater resources. Rivers and lakes mostly provide the surface waters whilst the groundwater resources are mainly from weathered basement aquifer and the alluvium aquifers. Water quality varies according to aquifer type. Most of the rural supplies get their water from the two sources.

WATER SUPPLY DEVELOPMENT

- **Rural Water Supply Schemes**

The provision of portable water to rural areas is either through the drilling of boreholes or construction of gravity fed schemes, from protected catchments

- **Gravity Piped Water Programmes**

The department constructed the first such scheme in 1968 in Zomba. The schemes are implemented with a full participation of communities. There are 56 gravity piped water schemes in the country and mainly operate on a self - help basis, maintenance wise. Over 2 million persons are served by the rural gravity fed schemes todate (Table 1.0) and (Fig 3.0)

Rural Groundwater Supply Programmes

Drilling of boreholes in Malawi started in the 1930's with mostly handpumps put to use. The programme has now even included the protection of shallow wells. The rate of installation has been variable over the years with a peak of over 500 boreholes per year in the period 1970 - 1980's when demand was high in the Agricultural Development areas (Table 2.0)

The design criteria is to supply 27 litres per day per head within 500 metres distance one way in integrated projects. Integrated projects of Livulezi, Lilongwe North East, Dowa West and Karonga Lakeshore Projects, have all tried to use the approach (Fig 3.0). Similar intergrated projects are in progress in Mchinji, Nsanje and Machinga districts. Government ministries, NGO's and the private sector have continued to support the groundwater development programmes. The government is currently rehabilitating 2,450 boreholes throughout the country under World bank/, IDA, UNCDF and UNDP funding.

There are nearly 8,781 boreholes and 5,669 shallow wells equipped with various handpumps, and serve over 2 million people (Table 3.0). There are over 1,000 boreholes that are motorised for use in urban or semi - urban centres or are privately owned. UNHCR and other NGO's own 1,011 boreholes which are yet to be handed over to government when their operations come to an end.

Community Mobilization

HESP programme relies heavily on community participation. Village Health Committees are formed and trained in their own problem identification, priotization planning, implementation, monitoring and evaluation of their village activities. each target village has a village health committee. activities of Village Health Committees are supervised by HESP Supervisors who are either a Health Surveillance Assistants or Health Assistants in the project area.

Training of Staff and Local Committees

Training is mainly conducted in order to equip staff and V.H.C. members with skills for promoting sanitation planning and conducting effective health education. These training course are mainly community based although are sometimes conducted at an are or district level. VHCs also take avery important part in training of the communities. Hygiene Education & sanitation promotion (HESP) is responsible for training of District HESP Coordinators, Health Assistants (HAS), Health Surveillance Assistant (HSAs) and Village Health Committees (VHC) in HESP activities.

Village Inspection

These are important for monitoring environmental improvements. These are conducted jointly with Village Health Committee members. Each target village must be inspected or visited at least quarterly every year.

Supervision

HESP activities are mostly supervised by a Health Assistant of the area. The Health Assistant has a number of Health surveillance assistants (HSAS) who are trained in HESP concepts like supervision and training of V.H.C.

The supervision frequently have little formal training in supervision, many supervisors become so through promotion to Senior Health Assistant (SHA) and because they have been good workers themselves. These supervisors know HESP work thoroughly well and know how to get over problems.

Meetings

Right from the village level H.V.C. meetings are held to discuss HESP activities. These meetings are encouraged at area, district, regional and national level to be held at least once a month.

Exchange Visits/Educational Tours

At area, district and regional levels, exchange visits are organized if funds are available to enable extension workers and local leaders like V.H.C. members share experiences from other successful people in a different area.

Procurement

Material resources like tools, equipment, teaching aids and transport have to be made available if HESP activities are to be successful. In most cases these resources are not easily available.

SUCCESSES

1. HESP has established a very effective participating bottom-up planning methodology. Planning for action is initially done at community level under the guidance of HAS's. The plans are then discussed at district level with HESP supervisors and later at a higher level if necessary.

2. HESP has established area and village health committees (VHCS) as local structures for affecting community involvement and participation. These committees mobolise local communities in implementing HESP activities

3. HESP has institutionalised participatory training as apopular method for imparting knowledge and skills of both health personnel and community members.

4. HESP has developed and produced posters reference and training manuals for training health staff (HAS's) and community members (VHCS).

5. HESP has developed tools for collecting and reporting data at all levels.

6. HESP has developed specific hygiene messages based on local practices of the communities. This has been achieved through knowledge and practices surveys which have been conducted locally.

7. HESP has trined a substantial number of Health Inspector, Health Assistants and Health Surveillance Assistants and Village Health Committee members (VHC) including women, in constructional and hygiene education training skills among other skills.

DROUGHT SITUATION AND ITS PROBLEMS

Malawi experienced the worst drought in 1992.

Almost 6 million people were severely affected by shortage of water which resulted into national water food shortage, poor personal hygiene and increased water related (shortage) diseases.

There were several epidemics of diarrhoeal diseases (including cholera).

There was a sharp increase in incidence of Malaria, respiratory infectious, tuberculosis, Conjuctivities and skin infections.

The demand of services on Limited, available resources increased.

The situation continued until 1993 harvest season and the negative effect on health indicators will persist for much longer.

HOW HESP ADDRESSED THE SITUATION

Diarrhoeal (Cholera) Diseases Prevention

During drought period people in affected areas were using any available water supply whether safe or not.

This resulted into epedermics of diarrhoeal diseases (like Cholera). The role of HESP project of the Ministry of Health was to render available water safe before use. The actual provision of the water supply was done by the Water Department of Ministry of Works.

Strategies

1. Chlorination of either shallow wells or pots by chloride of lime was done by Health Surveillance Assistants (HSA) in collaboration with the local leadership structure e.g. Village Headman.

2. One day orientation on Diarrhoeal diseases (Cholera), Malaria and eye infection with subsequent on the job continuing education.

3. Community based education (formal and informal) using available human and material resources.

4. Frequent and regular reporting on occurrence of water related diseases. Stationary required was paper, stencils, pencils (reporting forms were designed during orientation).

5. Patients were treated for diseases such as diarrhoea (Cholera), Scabies, Malaria and eye infections at community level by use of locally available resources.

6. Monitoring of water quality was done by Health Inspectors and Health Assistants using the standard testing kits.

7. Orientation of HSA's on disinfection and on proper handling of infected soiled materials.

8. Inspection of institutions and camps, was done by Health personnel i.e HI's, HA's and HAS's.

9. One day training in Health Education skills in Hygiene and Sanitation 580 HSA's were required for training.

10. The number of health surveillance assistants were to be increased by 20 in each affected districts. (see appendix B.)

ACTIVITIES RELATED TO CHOLERA CONTROL DURING DROUGHT PERIOD

1. Chlorination of water supply for prevention and control of Cholera and other related water disease.

2. Training of 580 Health surveillaance Assistants (HSA's) for carrying out the activities.

3. Health Education of women and children for creating awareness and promotion of community participation.

4. Strengthen of surveillance for water related diseases.

5. Community treatment of cases such as diarrhoe, cholera, scabies and eye infections.

6. Monitoring of water quality to determine the level of contamination.

7. Disnfection of infected human wastes for the prevention of the spread of Cholera.

8. Intensification of personnel, domestic and environmental hygiene education to prevent the contraction of water and sanitation related diseases.

REQUIREMENTS

1. All Health Units were equipped with adequate stocks of chloride of lime, basic drugs and equipments for the prevention of Cholera and other water related diseases to cater for the expected outbreaks

2. Transport in a form of vehicles, motorcycles and bicycles were made available to environmental - HESP and other relevant health personnel to enhance mobility during field activities throughout the preparation and all other stages of the disaster period.

3. Funds for institutional capacity building and for the establishment of surveillance systems were made available during the preparation and all stages of the drought.

4. Appropriate co - trainers were required to train HESP and other relevant health personnel in skills for the prevention and control of water related diseases.

5. Emergency camp accommodation in form of tents were required for use by staff and patients during severe outbreaks of Cholera and other infectious diseases that may occur during the disaster period.

6. Exchange of information through publications and meetings were of outmost importance to enhance the effective implementation of the proposed interventions.

Sanitation Promotion

HESP, Programme works towards 80% increase in coverage of sanitation facilities and improve conditions of sanitation facilities by the year 2000.

CONSTRUCTION

SAN PLATS AND WASHING SLABS.

Construction of san plants for improved latrines and washing slabs at water points in the existing water schemes ~~are~~ 15 the main HESP construction ~~materials~~ activity.

Community members are educated on how to make their own san plats. ~~Wing~~ Washing slabs are constructed by a health assistant with community participation in labour and local materials. The community is educated to make use of the constructed facilities.

MONITORING AND EVALUATION OF HESP ACTIVITIES

Health surveillance Assistant (HSA) collect baseline information when they begin work in 10 selected villages. Information collected includes the number of house holds with: latrines, bathrooms, kitchen, water storage system, dish racks and additional houses needing the above mentioned improvement, HESP Programme has numerous forms for various cadres of staff from an area Health Surveillance Assistant (HSA) level to supervisor, District regional and National Headquarters. These completed report forms and other reports help the National HESP Coordinator in his annual review of programme status showing activities under way, progress since the last review and overall status since the beginning of the programme.

8. HESP has achieved a high level of sanitation status. The average pit latrine status in HESP areas is 70% as opposed to 54% in non HESP areas.

9. There are more model villages and sanplat casting and installation activities in HESP target villages than non-HESP villages.

10. An average of 20% of the people wash hands in HESP areas after visiting the toilet as opposed to about 9%in non-HESP areas.

CONSTRAINTS

- There is shortage of staff at all levels. This is most prominent at Regional level where the programme depends on the support of R.H.I.s who are greatly overloaded. The national HESP Coordinator has just retired without a successor.

- Delays in securing funds from donors. This cause alot of delays in implementing activities.

- Transport is not adequate. This causes bottlenecks in supervision and distribution of materials.

- Inadequate training materials and teaching aids. Teaching materials and guidelines not developed.

- shortage of staff houses especially at Regional and community levels.

- Inadequate implementation period for HESP projects affect sustainability of the project.

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TABLE 1.0 : RURAL PIPED WATER SCHEMES IN MALAWI

	NAME OF SCHEME	DISTRICT	REGION	POPULATION
1	Chinunkha	Chitipa	Northern	7,500
2	Ifumbo	Chitipa	Northern	3,000
3	Chisenga	Chitipa	Northern	69,000
4	Iponga	Karonga	Northern	8,000
5	Ighembe	Karonga	Northern	7,500
6	Lufira	Karonga	Northern	45,000
7	Chilumba	Karonga	Northern	
8	Msaka	Mzimba	Northern	7,500
9	Nkhamanga	Rumphi	Northern	22,000
10	Lifutazi	Nkhatabay	Northern	7,000
11	Luwazi	Mzimba	Northern	15,000
12	Luzi	Mzimba/Rumphi	Northern	15,000
13	Thunda	Rumphi	Northern	4,000
14	Mhuju	Rumphi	Northern	2,000
15	Ng'onga	Rumphi	Northern	4,000

TABLE 1.0 : RURAL PIPED WATER SCHEMES IN MALAWI

	NAME OF SCHEME	DISTRICT	REGION	POPULATION
16	Hewe	Rumphi	Northern	15,000
17	Nthalire	Chitipa	Northern	4,500
18	Misuku	Chitipa	Northern	5,500
19	Champhira North	Mzimba	Northern	36,000
20	Champhira South	Mzimba	Northern	42,000

TABLE 1.0 : RURAL PIPED WATER SCHEMES IN MALAWI

	NAME OF SCHEME	DISTRICT	REGION	POPULATION
21	Mwansambo/Kasakula	Nkhotakota/Ntchisi	Central	37,000
22	Mwansambo/Mwadzana	Nkhotakota	Central	24,000
23	Mchinji	Mchinji	Central	37,000
24	Lizulu	Ntcheu	Central	11,000
25	Dedza	Dedza	Central	2,600
26	Dambole	Ntcheu	Central	
27	Ntonda	Ntcheu	Central	46,000
28	Kasinje	Ntcheu	Central	21,000
29	Nanyangu	Ntcheu	Central	30,000
30	Kalitsiro	Ntcheu	Central	
31	Chirobwe	Ntcheu	Central	

TABLE 1.0 : RURAL PIPED WATER SCHEMES IN MALAWI

	NAME OF SCHEME	DISTRICT	REGION	POPULATION
32	Mpira/Balaka	Ntcheu/Machinga	Centre/South	354,000
33	Lingamasa	Mangochi	Southern	18,000
34	Chagwa	Machinga	Southern	13,000
35	Doza	Machinga	Southern	1,500
36	Mkala	Machinga	Southern	2,000
37	Chinkwezule	Machinga	Southern	1,500
38	Liwonde	Machinga	Southern	34,000
39	Mirala	Machinga	Southern	19,000
40	Lifani	Zomba/Machinga	Southern	37,000
41	Chingale	Zomba	Southern	9,000
42	Kawinga	Machinga	Southern	105,000
43	Zomba East	Zomba	Southern	156,000
44	Muloza Crator	Mulanje	Southern	12,000
45	Muloza Drift (East)	Mulanje	Southern	59,000
46	Lichenya	Mulanje	Southern	69,000

TABLE 1.0 : RURAL PIPED WATER SCHEMES IN MALAWI

	NAME OF SCHEME	DISTRICT	REGION	POPULATION
47	Nalipili	Mulanje	Southern	26,000
48	Mulanje South West	Mulanje	Southern	30,000
49	Mulanje West	Mulanje	Southern	160,000
50	Chambe	Mulanje	Southern	9,000
51	Chilinga	Mulanje	Southern	4,000
52	Sambani	Mulanje	Southern	74,000
53	Phalambe	Mulanje	Southern	185,000
54	Mogowi	Mulanje	Southern	11,000
55	Namitambo	Chiradzulu/Mulanje	Southern	111,000
56	Zomba West	Zomba	Southern	78,000
57	Mwanza Valley	Chikwawa	Southern	60,000
58	Makwawa	Zomba	Southern	24,000

PLEASE NOTE: TWO OF THE 58 SCHEMES LISTED ARE SUB - SCHEMES.
THE NUMBER OF ACTUAL SCHEMES IS 56.

TABLE 2.0 GROUNDWATER SUPPLY SCHEME

Name of Programme	Funding Agency	Receipient Organisation	Period	Cost (MK)	Target Population	Project Contents		Remarks
						Borehole	Shallow Wells	
Dowa West	IFAD	Ministry of Agriculture	1982 - 86	530,000	70,000	144	190	
Lilongwe North East	IDA	do	1984 - 90	1,066,000	91,000	512	235	
Livulezi	Danida/Unicef	Water Department	1981 - 82	358,000	43,000	139	60	
Karonga Intergrated	Danida	do	1986 - 91	565,000	75,000	300	0	Shared maintenance scheme
Emgsweni	Unicef	do	1986 - 89	286,000	22,500	40	20	
Dedza Hills	IDA	Ministry of Agriculture	1987 - 88	650,000	71,000	167	220	
North Kawinga	Japan	Water Department	1989 - 90	989 mill	41,000	164	0	
Kasungu, Mchinji, Dowa East	IFAD	Ministry of Agriculture	1987 - 90	820,000	62,000	248		All rehab works on old wells
Salima - Bwanje	EEC	- do -	1987 - 90	1,600,00	48,250	193	0	
Salima - Nkhotakota	EEC	- do -	1991 - 92	2,500,000	50,500	53	25	
Nsanje	Unicef	Water Department	1992	-	-	200	100	
Dowa, Kasungu, Mchinji	IFAD	Ministry of Agriculture	1991 - 92	900,000	15,250	61	0	
Nammera - Mangochi	KFW	- do -	1989 - 92	2,260,000	47,500	130	0	
Central & Northern Malawi	IDA	Water Department	1992 - 94	USD 4.4 mill	262,500	1050	0	Rehab of BHs only in progress
Southern Region	UNCDF/UNDP	Water Department	1993 - 95	-	250,000	1000	0	In progress rehab are major work
Mchinji	Japan	do	1993	25 bill Yen	75,000	300	0	In progress
Kalembo	KFW	do	1992 - 94	4 mill	56,500	200	0	In progress (preparations)

Table 3.0

NATIONAL BOREHOLE AND SHALLOW WELL POPULATION
AS PER DISTRICT TO DATE 1993 WATER DEPARTMENT

DISTRICT	TOTAL POPULATION IN DISTRICT		POPULATION SERVED (APPROXIMATELY)	APP. WORKING % OF WELLS	REMARKS
	BH	SW			
CHITIPA	286	Nil	over 70,000	82	Majority population served by gravity schemes
KARONGA	631	Nil	over 150,000	93	Community based maintenance schemes operational
RUMPHI	304	150	over 75,000	94	Majority served by gravity schemes and the lake
MZIMBA	812	665	over 200,000	87	
NKHATA-BAY	72	50	nearly 18,000	76	Served by the lake also
TOTAL NORTH	2,105	(820)	over (513,000)	(86)	
LILONGWE	1,399	690	over 350,000	70	Served by rivers also
NKHOTAKOTA	227	169	over 55,000	90	Served by lake partly
DEDZA	566	306	over 140,000	85	Served by lake and rivers
MCHINJI	267	NIL	over 66,000	85	
KASUNGU	323	632	over 80,000	80	
NTCHEU	575	NIL	over 140,000	78	
SALIMA	412	202	over 100,000	85	Served by lake and rivers
DOWA	232	809	over 58,000	75	
NTCHISI	135	526	over 30,000	75	
TOTAL CENTRE	4,136	(3334)	(over 1,019,000)	(80)	

ZOMBA	260	200	over 60,000	75	Gravity scheme serves some
MANGOCHI	486	405	over 110,000	85	Lake serves part of population
MACHINGA	329	230	over 80,000	85	Served by schemes also
BLANTYRE	196	NIL	over 47,000	65	
MWANZA	128	NIL	over 32,000	60	
CHIRADZULU	77	16	over 18,000	50	
THYOLO	91	15	over 22,000	75	
MULANJE	185	65	over 43,000	75	Served by gravity schemes also
CHIKWAWA	428	321	over 100,000	85	Served by gravity schemes also
NSANJE	362	263	over 90,000	85	Served by gravity schemes also
TOTAL SOUTH	2,542	1,515	(over 602,000)	(74.0)	
GRAND TOTAL	8,781	5,669	over 2,134,000	-	

TABLE 4.0 : URBAN WATER SUPPLY SCHEMES IN MALAWI

	NAME OF SCHEME	DISTRICT	REGION	CURRENT POPULATION COVERAGE
1	Mzuzu	Mzimba	Northern	55,000
2	Mzimba	Mzimba	Northern	8,500
3	Rumphi	Rumphi	Northern	12,900
4	Chitipa	Chitipa	Northern	5,000
5	Karonga	Karonga	Northern	21,000
6	Ekwendeni	Mzimba	Northern	4,000
7	Chintheche I	Nkhatabay	Northern	1,200
8	Chintheche II	Nkhatabay	Northern	1,200
9	Nkhatabay	Nkhatabay	Northern	8,000
10	Chilumba	Karonga	Northern	4,500

TABLE 4.0 : URBAN WATER SUPPLY SCHEMES IN MALAWI

	NAME OF SCHEME	DISTRICT	REGION	CURRENT POPULATION COVERAGE
11	Bembeke	Dedza	Central	1,500
12	Dedza Town	Dedza	Central	22,000
13	Dedza Customs	Dedza	Central	100
14	Dedza Sec School	Dedza	Central	980
15	Ntcheu Town	Ntcheu	Central	5,500
16	Salima Town	Salima	Central	10,600
17	Nkhotakota	Nkhotakota	Central	10,000
18	Ntchisi	Ntchisi	Central	3,000
19	Dowa	Dowa	Central	2,500
20	Mponela	Dowa	Central	4,500
21	Likuni	Lilongwe	Central	8,000
22	Bunda	Lilongwe	Central	1,500
23	Mchinji	Mchinji	Central	5,600
24	Mvera Army	Dowa	Central	Estimate not made
25	Kamuzu Military College	Salima	Central	Estimate not made

TABLE 4.0 : URBAN WATER SUPPLY SCHEMES IN MALAWI

	NAME OF SCHEME	DISTRICT	REGION	CURRENT POPULATION COVERAGE
26	Kabudula	Lilongwe	Central	800
27	Kochilira	Mchinji	Central	1,500
28	Kasungu	Kasungu	Central	16,300
29	Madisi	Dowa	Central	4,500

TABLE 4.0 : URBAN WATER SUPPLY SCHEMES IN MALAWI

	NAME OF SCHEME	DISTRICT	REGION	CURRENT POPULATION COVERAGE
30	Zomba Town	Zomba	Southern	14,000
31	Namadzi	Chiradzulu	Southern	3,700
32	Domasi	Zomba	Southern	2,000
33	Machinga	Machinga	Southern	4,750
34	Liwonde	Machinga	Southern	4,380
35	Balaka	Machinga	Southern	11,000
36	Monkey Bay	Mangochi	Southern	4,850
37	Namwera	Mangochi	Southern	2,730
38	Mangochi	Mangochi	Southern	12,680
39	Kuchawe	Zomba	Southern	270
40	Thyolo	Thyolo	Southern	12,000
41	Mulanje	Mulanje	Southern	12,000
42	Nsanje	Nsanje	Southern	11,000
43	Phalombe	Mulanje	Southern	1,500
44	Mikolongwe	Chiradzulu	Southern	3,000

TABLE 4.0 : URBAN WATER SUPPLY SCHEMES IN MALAWI

	NAME OF SCHEME	DISTRICT	REGION	CURRENT POPULATION COVERAGE
45	Mwanza	Mwanza	Southern	8,000
46	Nchalo	Chikwawa	Southern	7,500
47	Luchenza	Thyolo	Southern	7,500
48	Chikwawa	Chikwawa	Southern	300
49	Muloza	Mulanje	Southern	6,000
50	Chiradzulu	Chiradzulu	Southern	9,000
51	Ngabu	Chikwawa	Southern	300
52	Bangula	Nsanje	Southern	(Under Upgradding cater for 5,000)
	TOTAL SERVED POPULATION			363,640

Malen.

WASA Southern Districts

6. Morija

Retic. Coverage: 69%
Total Population: 3430 (1993) Dom. Conn. Rate: 16%
Water Consumption: 79 590 m³ (FY 91/92)
Supply was lower during FY 92/93 due to drought effects. Presently limited to about 170 m³/day.

Sources are;

(i) Five production boreholes - Output about 120 m³/day
(ii) Earth dam and package plant - Output now 50 m³/day
with capacity - 120 m³/day.

Two newly-equipped boreholes in the area of the existing borehole field will initially add 172 m³/day thus alleviating water shortage.

Present realistic demand is probably about 230 m³ (average) and 320 m³/day (peak) although this will rise by about 15-25 m³/day when the new Highlevel Reticulation is commissioned.

Scenario 1

If borehole yields are maintained, with a slight improvement from the old boreholes after rains, total borehole supply will be about 320 m³/day. This will be sufficient to meet average demand until approx. 1998 with the Package Plant meeting seasonal peaks of up to 128 m³/day (approx. 18 hours/day operation).

This scenario is, however, considered to be highly unlikely.

Scenario 2

New borehole yields gradually drop to around the average rate for the area. (about 20-30 m³/day).

Borehole yield will thus stabilise at about 175 m³/day.

Some 55 m³/day of surface water supply will be required daily to meet Average Demands and 147 m³/day (approx. 21 hours/day) to meet current peaks. This surface water will simply not be available given the small catchment of 0,26 km and a stream intake will be required.

Proposed Integration of Borehole and Surface Water

1. Investigate proposed Matsieng wellfield
   Deadline: 1994 (Scenario 2) to 1997. (Scenario 1)
   Implement as required.

2. Develop surface water resource to meet demand peak increments of about 140-240 m³/day, with increased treatment capacity.

Source Options are: Lerato Weir and Pumping Scheme
Mafeteng West On-channel Dam
Makhoarane, and other, Gravity Intakes.

7. **Mohales Hoek**

Retic. Coverage: 83%
Dom. Conn. Rate: 25%

Total Population: 14 226 (1993, including Qalakheng)
Water Supply: 296 598 m³ (FY 92/93)
(of which 65% was derived from the distant and expensive Makhaleng source)

(i) **Surface Water**

The Makhaleng River has zero reliable flow, with failure periods of up to 35 days. To provide any reliable yield to this Regional Centre, an Off-Channel Storage Dam is required adjacent to the Intake.

The dam should be sized to supply 65-80% of the town's supply for a period of (at least) 50-75 days and preferably sized to at least year 2005 demands. Live capacity net of siltation and evaporation must thus be 60 000 to 110 000 m³.

(ii) **Groundwater**

Groundwater from the highlands East of Mohales Hoek would provide a strategic resource, as does the present Well and single Borehole. Reliable Yield from this area would save on expensive Off-Channel Storage, Treatment and Pumping/Pipeline capacity as well as prevent exhorbitant energy consumption. A total of at least 4-6 lps on a continuous basis should be aimed.

Makhaleng Intake

Present high-lift pumping capacity is 1120 m³/day but slow sand filter capacity is inadequate at nominally 624 m³ per day. Filter runs last only 2 to 3 weeks due to extreme turbidity of surface water.

expected average daily demands are expected to be; 1280 m³/day (2000)
1795 m³/day (2005)

Present Groundwater supply amounts to 170-180 m³/day leaving an average 1100 m³ per day to be supplied from surface sources by year 2000. Peaks are only marginally catered-for at present.

8. **Quthing**

Retic. Coverage:89%
Dom. Conn. Rate:25%

Population: 6127 (1993)
Water Supply: 169 505 m³ (FY 92/93)

The sole source at present is the Qomoqomong River via an (unsatisfactory) buried Intake. River dry periods of about one to three weeks are experienced at least once a decade, but more frequently the problem is high turbidity after rains. This can lead to a failure of supply for several days at a time followed by turbid water being supplied to consumers.

A Package Plant could provide an immediate answer to turbidity problems but the best solution is probably a Slow Sand Filter plant sized to 600 m^3 per day and extendable to 1 200 m^3 per day. A storage reservoir of about 6,3 Ml capacity could provide an initial 3 weeks Emergency Supply of water as well as act as an effective sedimentation tank, probably without the use of chemicals.

Present high-lift pump capacity is 1040 m^3 per day but can be increased by an additional pump.

Groundwater

Springs exist at Ha-Moshati and Lehlakeng which, if proven and available, could supplement supply at no energy cost. Borehole QT1 could be tested and re-equipped for intermittent use in case of emergencies.

9. **Qacha's Nek**

Retic. Coverage: 46%
Dom. Conn. Rate: 36%

Population: 4990 (1993)
Water Supply: 141 252 m^3 (FY 92/93)

Current Water Demand (before losses) is 380 m^3/day (Average) with peaks of about 540 m^3/day

Present high-lift pump capacity at Sejabatho is 302 m^3/day (LEC-14 hours) but could be increased to as much as 720 m^3/day.

Intake capacity is 1 300m^3/day but Filtration Capacity (4 55F's) is only a nominal 360 m^3/day.

Groundwater supply to Eastern sector amounts to 110 m^3/day at present.

Proposals

(i) Install chemical dosing and flocculation apparatus at Sejabatho Treatment Works.

(ii) Complete booster pumpstation to deliver treated water to eastern sector.

(iii) Investigate use of Ramaroke Spring.

Long - Term Measure

Construct On-Channel Dam and Treatment Works at Upper Sejabatho to supply up to 1200 m^3/day (2005 peak demand).

10. **Roma**

Population : 9 439
Water Supply : 14 000 - 18 000 m^3 per month (NUL only)

Reticulation Coverage : 87%
Dom. Conn. Rate : zero

Proposals of;

(i) Re-constructing production boreholes and integrating with NUL surface water:

(ii) Lower Qhobosheaneng Reservoir

Expected Water Demands of

	Average	Peak
1995	845	1180
2000	1349	1890
2005	1763	2470
2010	2473	3460

WASA - NORTHERN DISTRICTS

Teyateyaneng

Population Estimates - Est. growth rate 4.5%

Year	Population
1993	17600
1995	19220
2000	24000

Water Supplies

Source	Current Draw - Off	Design Capacity	Drought Yield
Phuthiatsana River (submersible pump)	237 m³/day	300 m³/day	-
Lerrico Wellpoints	648 m³/day	1 200 m³/day	172 m³/day
St. Agnes Boreholes	195 m³/day	230 m³/day	80 m³/day
New Phuthiatsana BH's & St. Agnes	-	1 958 m³/day	-
Total	1080 m³/day	3 688 m³/day	252 m³/day

Problems: During drought there is zero flow in Phuthiatsana river hence submersible pump cannot be used.

Poor performance of Lerrico wellpoints, probably due to poor design, installation etc.

Very low yield from the boreholes especially during drought situations.

Proposed Solution: Construction of an off-channel storage and a new treatment works in order to augment supply during drought situation.

Present Demand and Coverage

Only 55% of the population is served 30½% by house connections and 25% by standpipes. Total consumption, including commercials, government and institutions is approx. 425 m³/day, giving 61% losses on distribution system. T.Y. distribution network is in a very poor conditions.

Projected Future Demand

Year	Population served	Type	Demand
1995	35%	House connections	808 m³/day
	65%	Public standpipes	375 m³/day
		Ind, Comm, Gorn+Inst	103 m³/day
			1286 m³/day
2000	55%	House connections	1 584 m³/day
	45%	Public standpipes	324 m³/day
		Ind. Comm. Inst+Govn	118 m³/day
			2 026 m³/day

MOKHOTLONG

Population Estimates - Est growth rate 4%

Year	population
1993	2915
1995	3400
2000	4150

Water Supplies

Source	Current draw-off	Design capacity	Drought yield
Mokhotlong River (normally on standby)	353 m^3/day	1000 m^3/day	151 m^3/day
Phutha springs	55 m^3/day	80 m^3/day	25 m^3/day
Totals	407 m^3/day	1080 m^3/day	176 m^3/day

Problems: Very low or zero flow from Phutha spring during drought situation.

High turbidity in Mokhotlong River during high flows. Very low yield during drought and high energy consumption while in use. Also poor performance of the gallery most of the time.

Proposed solution: Improve the spring intake and construct an off-channel storage and install a mini treatment works in order to improve quality.

Present Demand and Coverage

65% of the population is served. 34% by house connection and 31% by public standpipes. Total consumption including Govn + comm is 188 m^3/day, giving 46% losses.

Projected Future Demand

Year	Population served	Type	Demand
1995	38%	House connections	155 m^3/day
	62%	Public standpipes	632 m^3/day
		Comm Inst + Govn	130 m^3/day
			917 m^3/day
2000	45%	House connections	224 m^3/day
	55%	Public standpipes	685 m^3/day
		Comm Inst. + Govn	143 m^3/day
			1052 m^3/day

MAPUTSOE

Population estimates: Est growth rate 6%

Year	population
1993	13650
1995	17500
2000	23100

Water Supplies

Source	Current draw-off	Design capacity	Drought yield
Two towns BH's	700 m^3/day	1296 m^3/day	350 m^3/day
BH9	346 m^3/day	846 "	180 "
Caledon River wellpoints	-	-	-
Total	1046 m^3/day	2142 m^3/day	530 m^3/day

Problems: Poor performance of the wellpoints, yield - 0
Boreholes run 24 hrs/day - which is bad practice but since there is no other alternative they have to be run 24 hrs/day. BH9 yield has decreased drastically - probably because of overpumping - no time for recovery.

Proposed solution: Improve the wellpoints in order to increase production and to enable proper running and monitoring of the boreholes.

Present Demand and Coverage

Only 54% of thepopulation is served, with a consumption of 710 m^3/day including commercials, govn, institutions, and industries. This gives 32% losses on distribution system.

Projected Future Demand

Year	Population served	Type	Demand
1995	35%	House connection (120l/c/d)	735 m^3/day
	65%	Public standpipes (30l/c/d)	342 m^3/day
		Ind, Inst, Comm +Gvrt	335 m^3/day
Total			1412 m^3/day
2000	55%	House connections	1525 m^3/day
	45%	Public standpipes	312 m^3/day
		Ind. Inst Comm + Gvn	503 m^3/day
Total			2340 m^3/day

Leribe

Population estimates : Est. growth rate 4.5%

Year	population
1993	10990
1995	12000
2000	15000

Water Supplies

Source : Hlotse river - Wellpoint system
Current draw off - 920 m^3/day
Design capacity - 1987 m^3/day
Drought yield - 700 m^3/day

Problems : High turbidity during high flows and failure to deliver the design capaicty yield.

Proposed solution : Rehabilitation of the system in order to improve quality and increase the yield.

Present demand - 630 m^3/day vs 920 m^3/day produced, meaning 32% losses within distribution system.

Coverage - 39% on house connections and 32% on public standpipes
= 71% population served.

Projected Future Demand : Target: 45% of the population on house connections by 1995

55% " " public standpipes by 1995
55% on house connections by 2000
45% on public standpipes " "

Coverage: Only 71% of the population have access to water at present, therefore, in order to serve the whole population water production has to increase so that demand can be meet.

Proposals: Incooporate Subeng stream with on channel storage into the existing distribution system and rehabilitate the distribution system and the old treatment works.

- Ground water exploration and development in the area
- Release water from Thaba Phatsoa Dam into Hlotse River during drought.

Possible Future Demand

Year	Population served	Demand		Demand
1995	45% - house conn	648 m^3/day	55% public standpipes	198 m^3/day

Inst. Govn. + Comm - 280 m^3/day

: Total demand by 1995 - 1126 m^3/day

2000

Population served	Type	Demand
55% (120l/c/d)	house connection	990 m^3/day
45% (30l/c/d)	public standpipes	203 m^3/day
Inst. Govn. + Comm		308 m^3/day
		1501 m^3/day

BRIMME

WORKSHOP ON OPERATION AND MAINTENANCE OF
RURAL AND URBAN WATER SUPPLY AND SANITATION SYSTEMS
HARARE, 8 - 12/11/93

A PAPER ON RURAL WATER SUPPLY IN MOZAMBIQUE AND BEIRA WATER DISTRIBUTION SYSTEM

Prepared by:

LUIS ELIAS
MAGALHÃES MIGUEL

November 1993

WORKSHOP ON OPERATION AND MAINTENANCE OF RURAL AND URBAN WATER SUPPLY AND SANITATION SYSTEMS HARARE, 8-12/NOVEMBER/1993

ABSTRACT

1. The objective of the first paper on the "Rural Water Supply in Mozambique" - is to report the efforts made to implement an effective system of decentralized operation and maintenance for handpumps at village level.

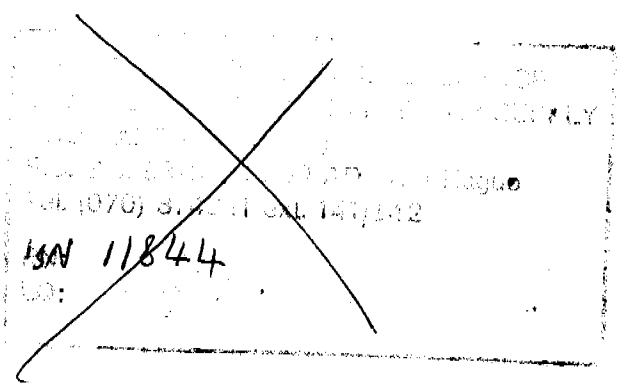
   An analysis of the previous maintenance system, depending on motorized maintenance brigades operating from province or district capitals, resulted in the conclusion that it was unable to satisfy the constant maintenance needs of all handpumps in the rural areas. When a handpump broke down it used to take time to communicate the break down to the centralized maintenance brigades at the Provincial Water Workshop and as a consequence the population stayed without being able to pump safe water from their source.

   The actual solution consist in the creation and training of a group of villagers who participate in the instalation procedure of the handpump and afterwards guarantee the preventive maintenance of the pump. The pump used in these cases is the AFRIDEV (VLOM). The maintenance group is equipped with basic tools and spareparts.

   The maintenance group is also responsible for organising the beneficiaries to contribute for payment of the acquisition of more spareparts.

2. The second paper concentrates on improved operation and maintenance of the water supply system by decreasing leaks and waste of water from the network.

   Decreasing of leakages have been made through rehabilitation of the network and house connections with an organized and systematic involvement of the community using approved policies of "ÁGUAS DA BEIRA".



1. *RURAL WATER SUPPLY IN MOZAMBIQUE*

1.1. INTRODUCTION

According to 1980 sensus about 80% of the Mozambican population lives in the rural areas equivalent an approximately thirteen millions of the inhabitants. In 1975 (year of Independence) the rural safe water coverage was only 5 per cent of the population. Since then many efforts were undertaken to increase this coverage, and as result year by year we observed a great increase of rural safe water coverage. In 1980 the coverage from 5 per cent of the population to around 33 per cent of the resident rural population in 1992. Because of lack of accurate information about how many constructed water sources are out of operation we estimate that only 28% of population living in rural areas have access to a safe drinking water. This low coverage is justified by isolation of many rural areas caused by the war which also destroyed many water infrastructure. The 28 per cent coverage, are referred to the population supplied by shallow wells and boreholes equipped by hand pump. And around 5 per cent of the rural population are supplied by small piped water supply system.

1.2. RURAL WATER SUPPLY PROGRAMME

As result of many attempts without success for solution of provision of potable water to the rural communities, the National Rural Water Supply Programme (PRONAR) was created in 1987. It is the central level structure responsible for promotion, coordination, and technical assistance for all rural water supply activities in the country including:

Shallow wells and borehole construction, handpumps installation and maintenance, small piped water systems and the Community Participation and Education Programme.

As can be seen in the Annex diagramme A. PRONAR is integrated into the National Directorate of Water Affairs "DNA" of the Ministry of Construction and Water "MCA". The implementation of the National Rural Water Programme is under the responsibility of the Provincial Governments through the

Provincial Directorate of Construction and Water "DPCA".

Each DPCA has a production unit called the Provincial Rural Water workshop "EPAR", which carry out their rural water supply programme through one or more district workshop. When a district does not have its own workshop, its rural water supply activities are carried out by a mobile team from the Provincial workshop.

The principal tasks of EPAR as described as follows:

- Construction and recuperation of shallow wells.
- Construction of manual and mechanical boreholes.
- Installation and maintenance of handpumps with community involvement.
- Recuperation, rehabilitation extension and assistance to operation and maintenance of small piped water supply systems.
- Implementation of the Community Participation and education in Rural Water Supply Programme.

1.3. THE PROGRAMME POLICY

To simplify the execution of the Programme, PRONAR decided to establish a unique policy in rural water supply activities in the country. The established policy is one source of portable water source for 500 people or 100 families within a distance of 500 metres from their residence areas.

Another important policy is the standardization of hand pumps throughout the country to ensure ease of maintenance, repair and access to spare parts as well as to introduce the decentralised maintenance. Thus PRONAR has encouraged, the local manufacture of the "VLOM" hand pump in this case AFRIDEV. To ensure local availability of pumps and spare parts makes the procurement a lot easy and fast. The requirement of foreign exchange is less because only raw material are imported, local manufacture is in a position to provide a better after sales service specialy for spare parts than a foreign supplier and to responde field complaints or requirements through research and development efforts quickly.

To guarantee the success of its Rural Water Supply Programme, PRONAR has designed and introduced as policy, a Community Participation and Education Component. This ensure that the community participates in the planning, construction and maintenance of the new source of potable water and achieve that:

- The beneficiaries/users are the owner of the new source and thus responsible for operation and maintenance.

- To reduce to a minimum the user group's dependency regarding maintenance related inputs from outside the community.

- To stimulate to a maximum the ability of the user group to effectuate all possible repairs training.

- To introduce a decentralized maintenance system.

- The users group financial contribution is the basis of the decentralized maintenance system, although it should never force people to go back to the unprotected traditional water source.

- It is a government responsibility to guarantee that all conditions are created so that village level maintenance can take place, spare parts must be available for sale, close to the village.

1.4. SOME EXPERIENCE ABOUT DECENTRALISED MAINTENANCE

PRONAR had planned to start the introduction of the AFRIDEV handpumps in small pilot areas. Based on the results, extension to other parts of the country would follow. However, this approach failed.

Due the recent severe drought, it was decided to import in mass AFRIDEV handpumps to be installed on water points which up to then never had been equipped pumps, on new water points and to replace existing obsolete handpump.

As much as possible, it was tried to train field (community) workers in installing of handpumps, and in training the community to maintain the pumps, a complete new approach for the field workers.

Although with difficulties, in certain provinces this

decentralised maintenance system, has shown to be successful: the community is able to maintain the pump. However, in terms of distribution of spare parts and organization within community for collecting and managing money for maintenance, no system exist yet.

It is difficult to establish a fixed system just like that. The system should fit in the local traditions and possibilities. The community workers have an important role in collecting information and stimulating the community in organising themselves.

More than ever, the community workers need time to work together with the communities to get the best results; feeling of ownership and therefor the willingness to maintain the well with pump and pay for it.

Because of the economic pressure (= no pay no work), the tendency is to speed up construction, leaving no time and attention for quality and community workers.

Today, the major battle within the programme is to get a sound balance between the needs of the community and the construction speed. Once established that balance, the Programme can continue to introduce a complete decentralised maintenance system including a community based management and operation of maintenance and a nationwide distribution network for spare parts.

By: Luis Elias

MOZAMBIQUE

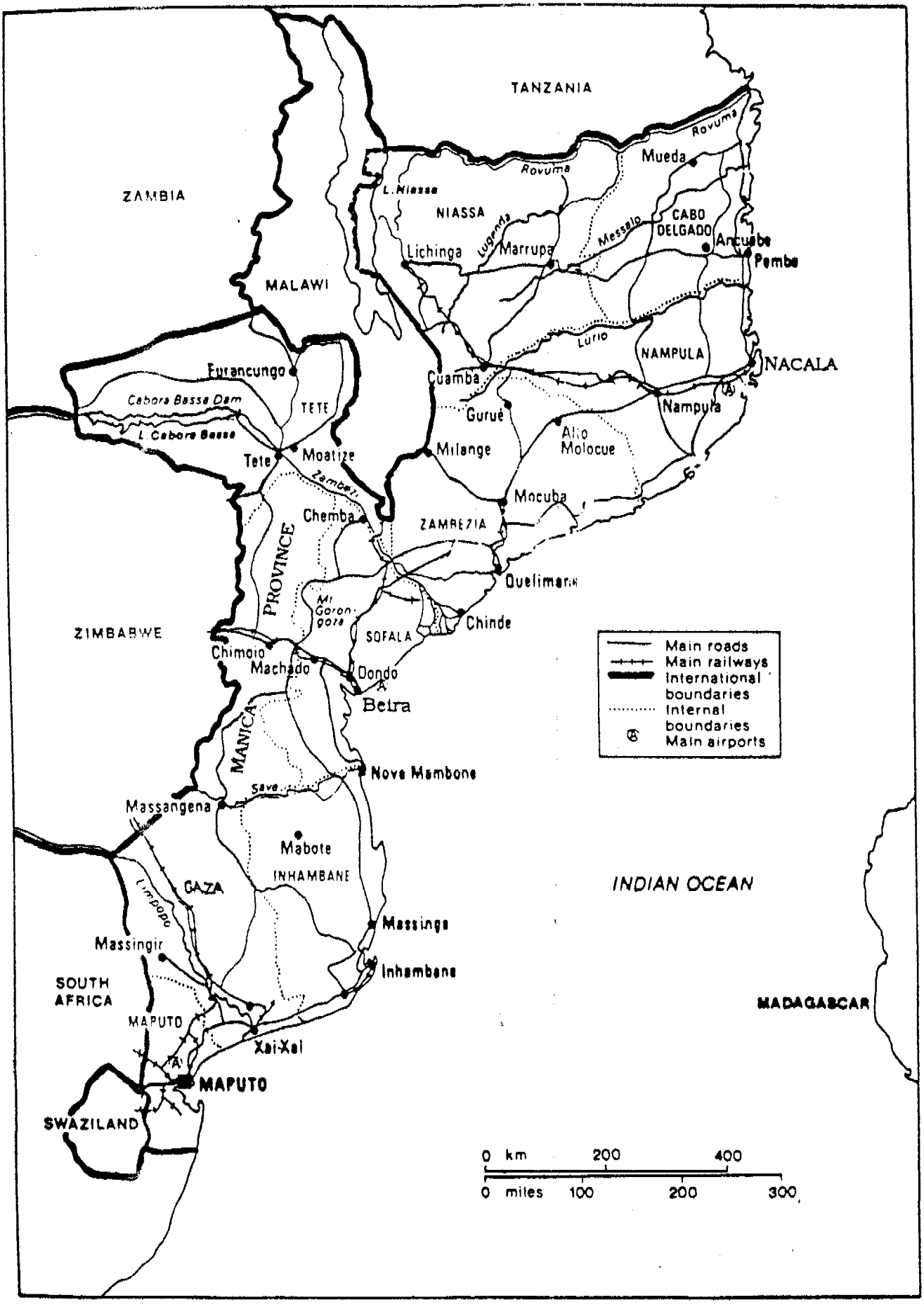
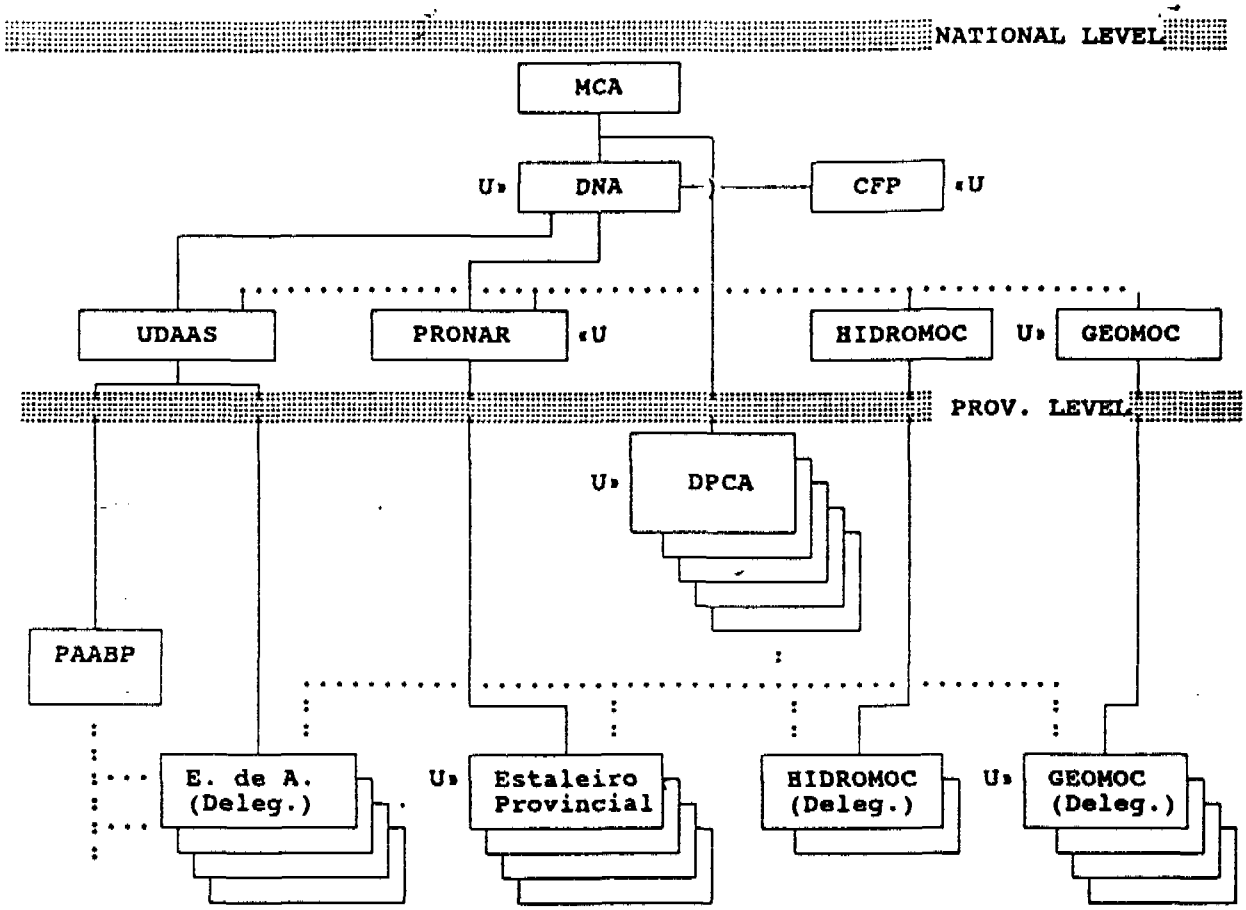

TANZANIA
ZAMBIA
MALAWI
ZIMBABWE
SOUTH AFRICA
SWAZILAND
INDIAN OCEAN
MADAGASCAR
NIASSA
CABO DELGADO
NAMPULA
TETE
ZAMBEZIA
MANICA
SOFALA
INHAMBANE
GAZA
MAPUTO PROVINCE
Rovuma
L. Niassa
Lugenda
Messalo
Lurio
Cabora Bassa Dam
L. Cabora Bassa
Zambezi
Mi Gorongoza
Limpopo
Save
Mueda
Lichinga
Marrupa
Pemba
Nacala
Furancungo
Cuamba
Gurue
Nampula
Tete
Moatize
Milange
Alto Molocue
Mocuba
Chemba
Quelimane
Chinde
Chimoio
Machado
Dondo
Beira
Nova Mambone
Massangena
Mabote
Massinga
Massingir
Inhambane
Xai-Xai
MAPUTO
Main roads
Main railways
International boundaries
Internal boundaries
Main airports
0 km 200 400
0 miles 100 200 300

Figure 13

THE WATER SECTOR IN MOZAMBIQUE
ORGANIZATION CHART



LEGEND:

MCA - Ministry of Construction & Water
DNA - National Directorate for Water
CFP - Professional training centre of DNA
HIDROMOC - State Hydraulic Equipment Company
GEOMOC - State Water Drilling Company
UDAAS - Association of Water Companies
PRONAR - National Rural Water Supply Program
PAABP - Program for Peri-urban Water Supply
DPCA - Provincial Directorate for Construction & Water
E. de A. - City Water Supply Company
ESTALEIRO PROVINCIAL - Provincial Rural Water Workshop

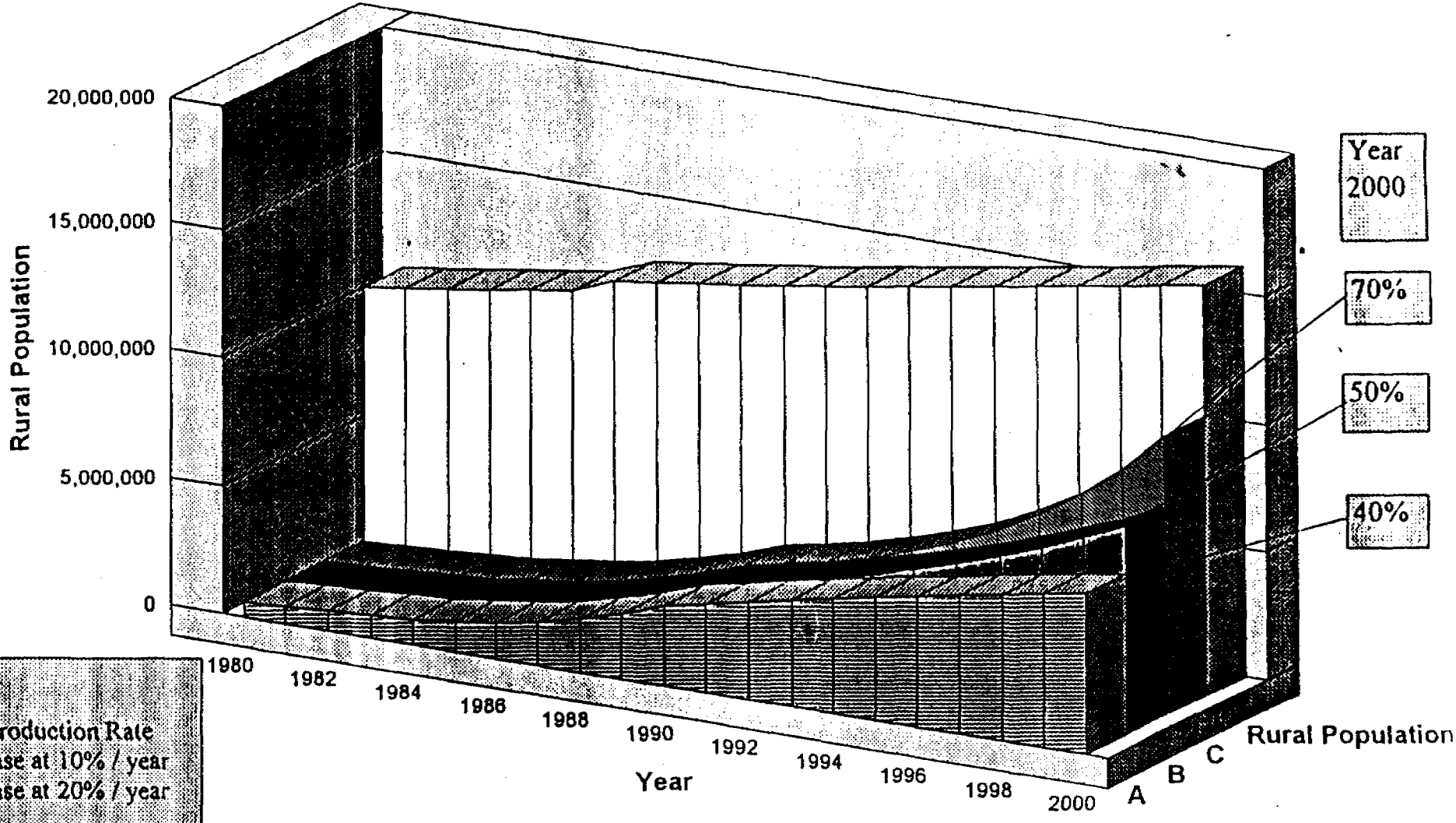
—— direct control
... indirect control

U» UNICEF tech. input

Figure 13

Rural Water Supply Coverage

Scenario Chart



SCENARIOS

A - Constant Post 92 Production Rate
B - Post 92 Rate Increase at 10% / year
C - Post 92 Rate Increase at 20% / year

Figure 3

WATER POINT PRODUCTION

CUMULATIVE TOTALS

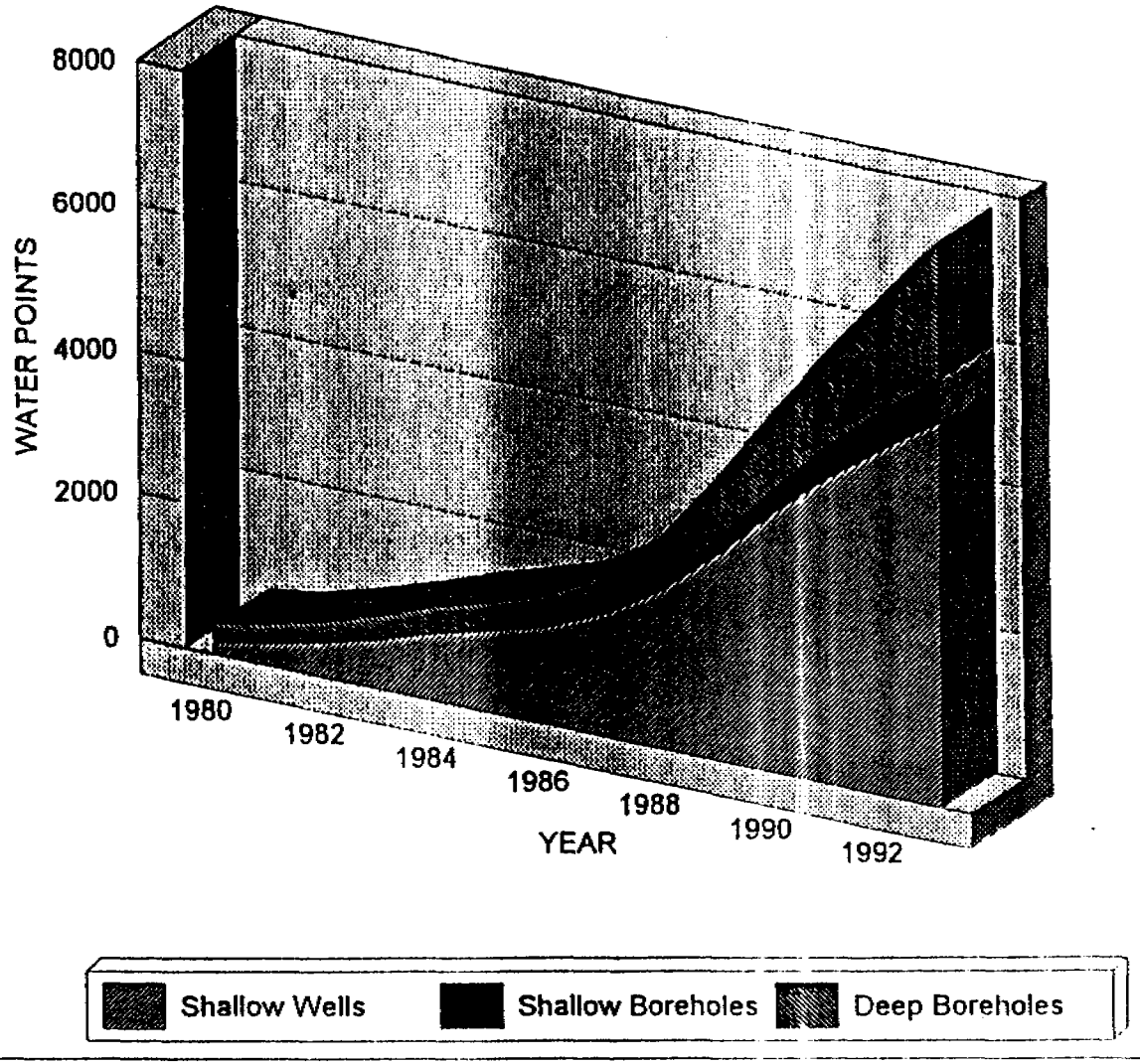


Figure 4

National Rural Water Supply Programme

Water Source Production 1980 - 1992

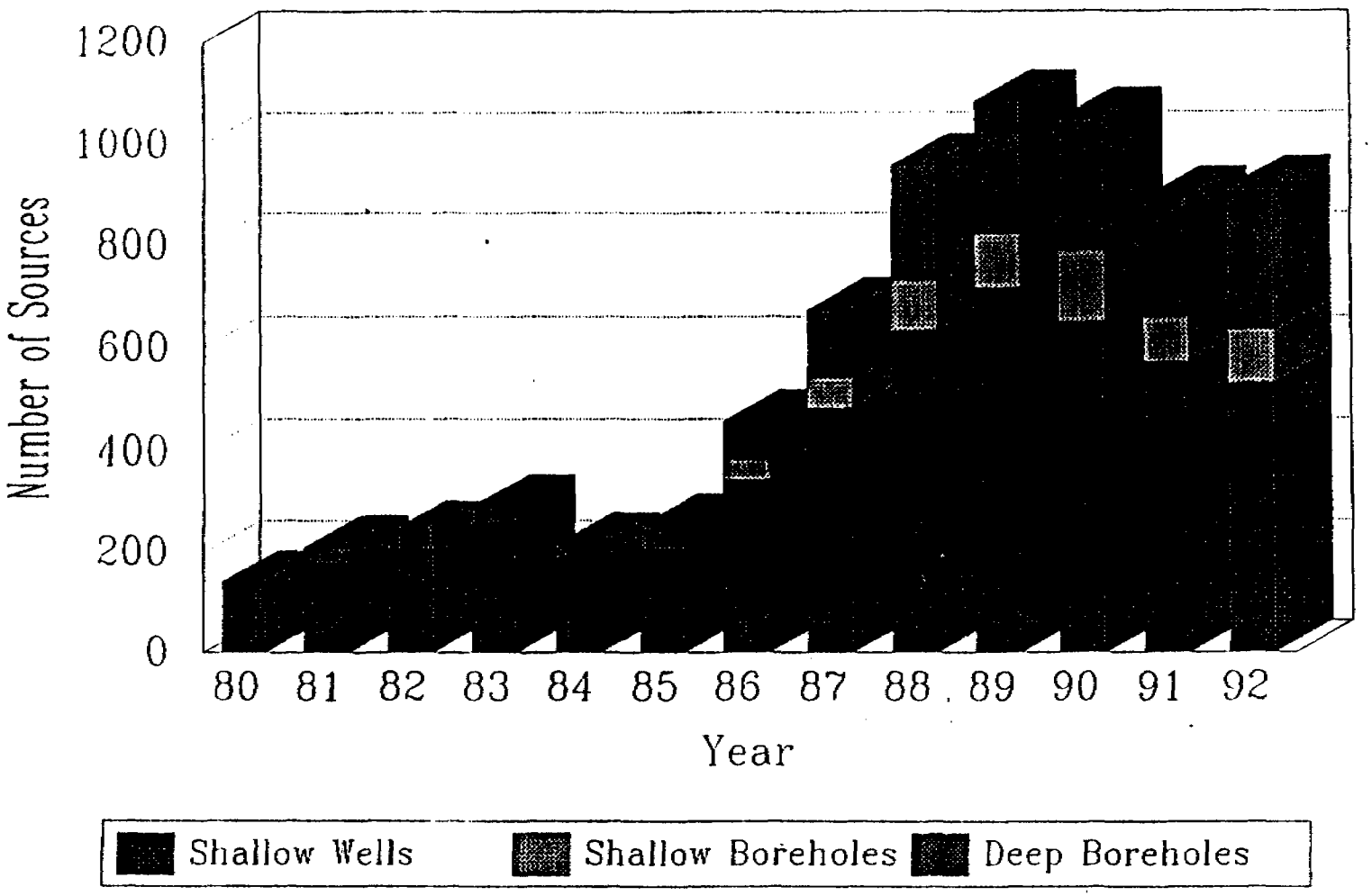
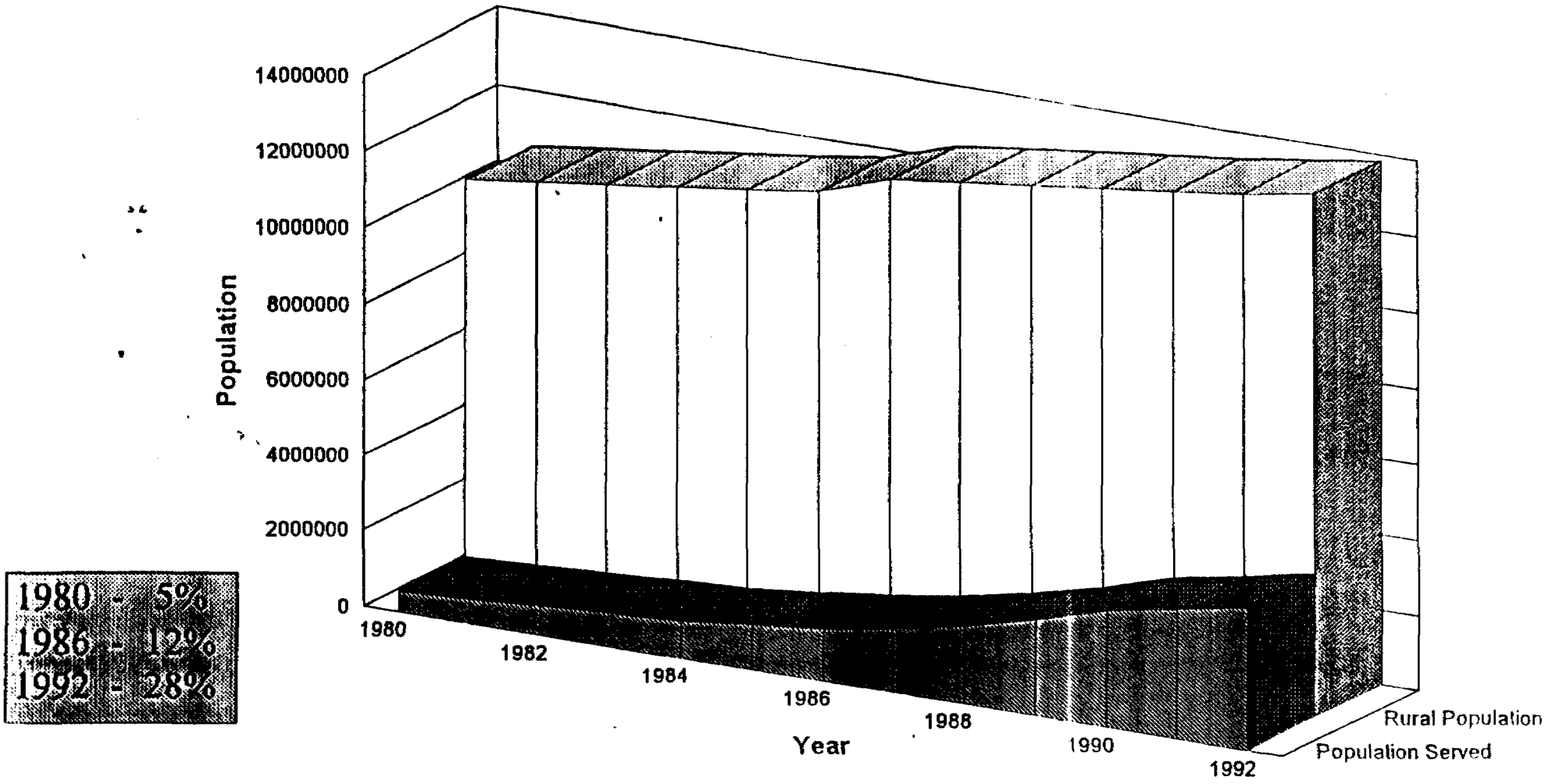


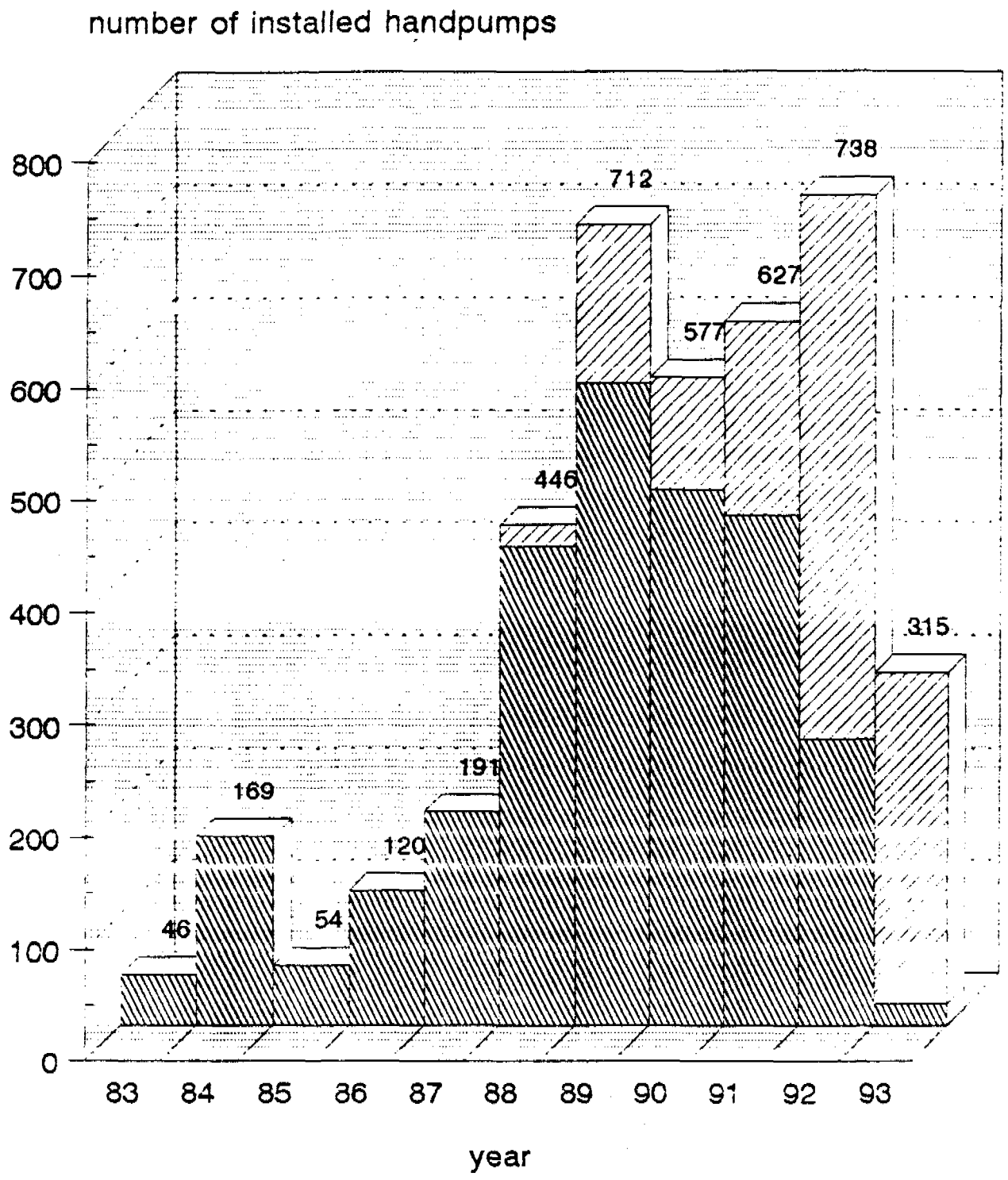
Figure 5

Rural Water Supply

Service Coverage



HANDPUMP INSTALLATION IN MOZAMBIQUE
1983 -1993



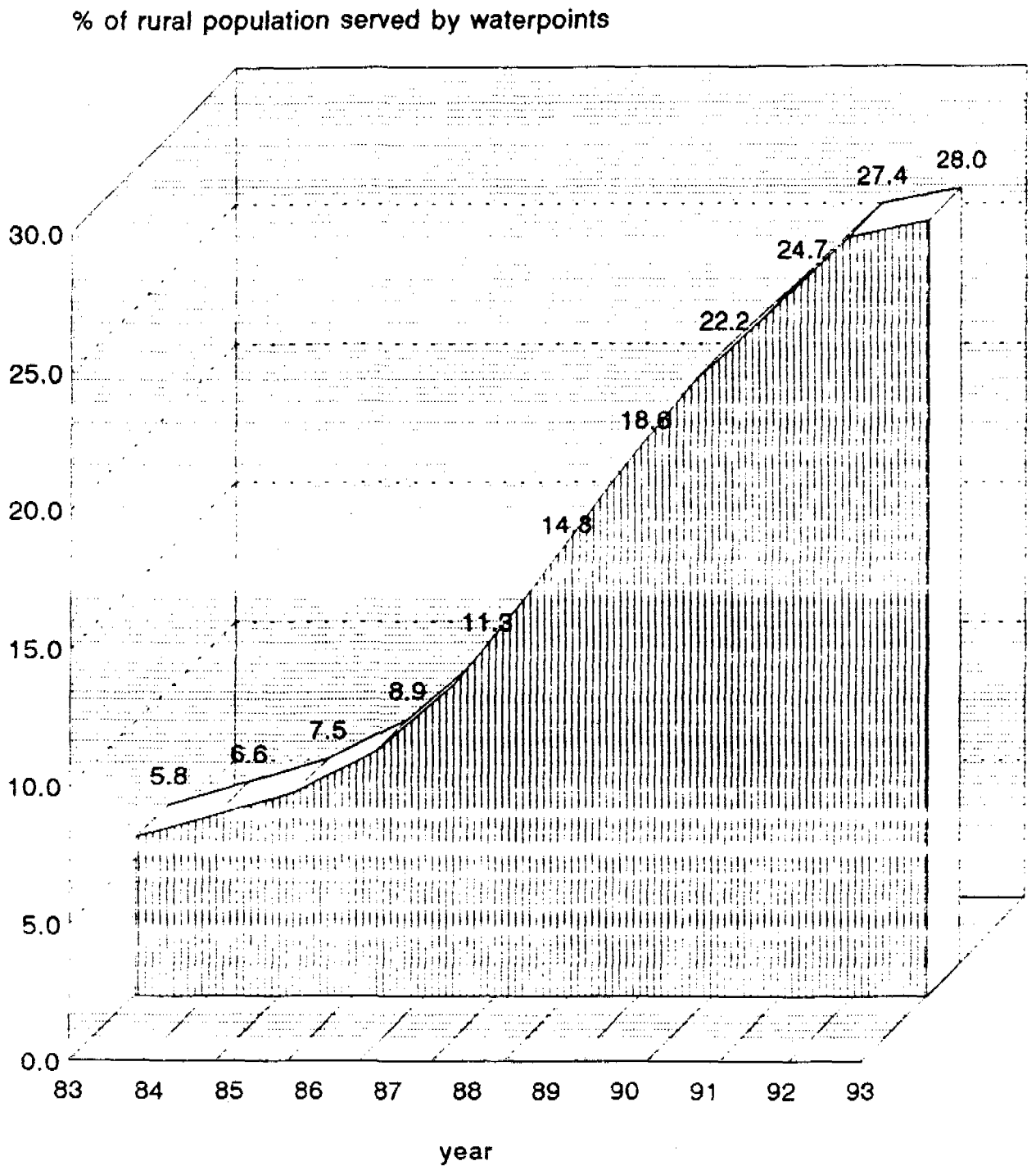
NB: 1993 data refer to first six months only

source: PRONAR, November 1993

RURAL WATER SUPPLY IN MOZAMBIQUE

GROWTH OF COVERAGE IN RURAL AREAS

1983 - 1993



NB: 1993 data refer to first six months only

source: PRONAR, November 1993

2. *BEIRA WATER DISTRIBUTION SYSTEM*

2.1. INTRODUCTION

Beira is the second largest town in Mozambique and the capital of the Province of Sofala. It is located on the Indian Ocean centrally in the country. The City of Beira has the largest port in the region, with an important role in handling and transport of merchandise to the hinterland areas and countries like Zimbabwe, Zambia and Malawi, not having their own access to the sea. The port, railway and road systems provide a potential for the development of the City.

The City of Beira has grown around the port and the railway terminal. The beginning of industrial activities in the fifties started the extension of the land use to the surrounding areas of the city. In those areas construction has taken place precariously and building up a proper sanitation and water supply has often been neglected. That kind of land use tends to grow, continuously occupying new parts of the town.

The urban area is divided into three main regions: the so called "Cement City", Manga and Inhamizua.

The "Cement City" is characterized by the biggest population density, concentration of commercial and some industrial activities. The "Cement City" covers also semi-urban areas.

The type of land use in Manga is urban, and the area has its own commercial and industrial centres. It is located next to the "Cement City".

Inhamizua is a non-urban area and is used mainly for activities of small scale family agriculture.

According to the census of 1980, Beira had a population of 214 608 inhabitants. In 1986 the official estimate was of 270 852 inhabitants. The annual growth was estimated to be 5.5%.

The existing water supply system of the town is mainly from the 1950'ies and 1960'ies. According to the census of 1980, around 150 000 people were covered by the water supply system of these, 40% or 60 000 people, were served through house connections. The present number is not so high, unfortunately.

This presentation concentrates on an improved operation of the water supply system with a special emphasis on decreasing leakages and wastage of water in the network.

2.2. WATER SUPPLY NETWORK

There are two water distribution systems in Beira: one in Manga and the other in the "Cement City". Manga distribution network built during the sixties and the seventies is rather new. The total length of the network is about 24 km, the sizes of pipelines being 100 and 200 mm. The material of the pipes is asbestos cement. The leakages in this network are insignificant compared with those in the "Cement City".

The distribution network of the "Cement City" was mainly built between 1951 and 1954. The system consists of 118 km of pipelines the diameter of pipes varying between 100 and 600 mm. The material of the pipes was asbestoscement. Galvanized pipes were used for house connections but polyethene pipes have been used in later replacement, especially for small bore pipes.

The daily distribution of water takes place through a pumping of 8 to 10 hours in two periods (in the morning and the afternoon). The water is pumped directly to the distribution network. The reasons for the interrupted daily supply are the limitations in water abstraction and problems with the transmission system such as frequent pipe bursts and leakages.

A programme for control and reduction of leakages was started in 1989. Nine pressure gauges (manometers) were installed at selected points of the network in order to record the pressure (see Appendix 1).

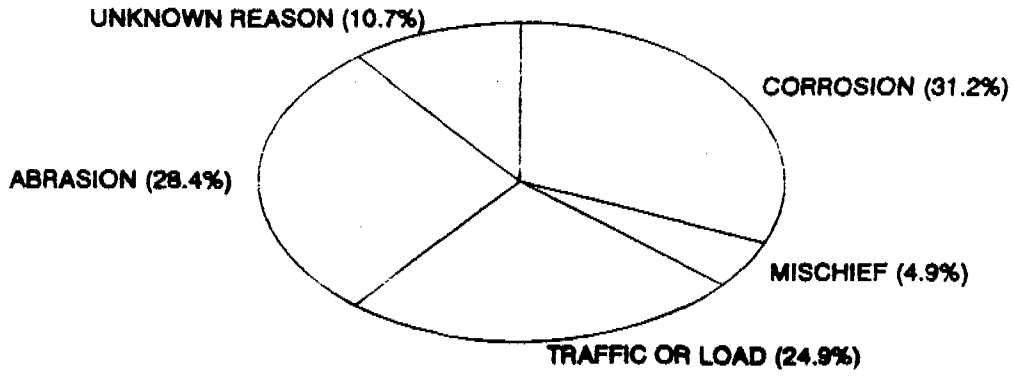


figure no. 1

It is notable, that even at an average pressure of 1.2 bar in pumping to the network from Munhava Distribution Centre constant damages of pipes takes place in the network (see Appendix 2).

The age of the network, the agressivity of the soil and foundation conditions are the main factors causing the disruptions. Figure 1 shows the main causes of disruptions and their relative precentage of occurrence.

The continuously increasing water demand of the population, combined with difficulties in operating and maintaining the existing system, have forced the national water authorities to carry out studies and to plan specific actions to be taken in order to reduce leakages. The present level of leakage has been estimated to 45 to 50% of the total production of water.

The first attempt of Aguas da Beira (AdB) to rehabilitate the network and house connections, with an organized and systematical involvement of the community included, took place in the area of Pioneiros. A need for increasing the role of the community involvement as permanent routine in the physical rehabilitation was identified during the work. It is there to stay, but needs a continuos improvement and development to work well.

Parallel to development of the process for rehabilitation of house connections, AdB has created a similar system to involve the community in rehabilitation of standposts in peri-urban areas. Experience gained in connection with standposts will be referred to later on.

2.3. THE CASE "PIONEIROS"

2.3.1 - Background

The supply of water to houses and buildings is organized through house connections with individual water meters under an agreement with AdB.

At the moment the house connections and the internal piping of properties are in most of the cases corroded or damaged and need repair or complete replacement.

APIE, the governmental organization for the maintenance of buildings, faces huge technical and financial difficulties in maintaining and repairing the house connections and the internal piping.

Concerned with this situation AdB has started the rehabilitation of the public network in the area supported by external financing by Finnida. According to the approved policy of AdB on house connections, the properties can remain connected to the public network only in cases where there are no leakages in the internal piping. Otherwise the house connection will be replaced by one or more temporary taps in the yard and the supply to flats shall be disconnected until repaired by APIE or the tenant.

The solution of temporary yard taps in connection with large buildings with several flats, requires a representative of the dwellers to be selected. He shall be responsible for the establishment of an overall agreement with AdB and the collection of funds for payment of water consumed.

2.3.2. Results achieved

2.3.2.1 Pioneiros

The rehabilitation of the public network in Pioneiros started last year and was completed in April 1993. The objectives - decrease leakages, improve the water supply service, and increase income through efficient billing and collection - were mostly reached.

As a result of the rehabilitation the pressure increased from 0.2 to 0.5 bar and a considerable reduction of leakages could be noticed. There also was some improvement in billing, but many problems still remain with the collection of payments for water.

The rehabilitation was most successful technically but the commercial or community involvement aspects were still felt to need additional efforts. This could be seen in the positions of the consumers during the rehabilitation. The following attitudes were repeated in meetings with the consumers:

- there was an apparent acceptance of yard taps, but also a doubt about the practical organization of management and guaranteeing the collection of money from all the apartments in the building using the water
- acceptance of common taps and water meters was not spontaneous and there existed a preference for maintaining the present individual metering

Selection between individual services or common yard taps mainly was based on economica conditions of consumers. Two different possibilities were made available:

- to continue having an individual tap and water meter after the pipes and valves were repaired and no-leakage of the system was verified through a pressure test
- accept a temporary solution of service through a common yard tap and water metering

Whenever the consumers did not accept one of the above mentioned alternatives, AdB disconnected the consumers from the supply.

2.3.2.2 Standposts

The standposts are used as the primary technology to supply water in suburban areas. Traditionally this water has not been paid for, which in turn has caused wastage of water. The non-payment of the water by the City Council, the actual client, has also caused problems to the Water Company.

Heavy leakages and waste of water is still an unsolved problem in this field. AdB has decided to solve the situation by making new consumer contracts only with the community responsible for the standposts.

The first results exist and are promising. The selection of a representative of users as a link between AdB and the community has been a voluntary and spontaneous act. In many cases, the representatives of the community themselves have contacted the company and requested an extension of the distribution system to their dwelling areas.

The community has normally showed a willingness to pay for their water, and participate in the process of improving the services as defined in the approved policies of AdB. The supplies then have been managed by the consumers.

The positive attitude arises from the fact that the water of the public supply system costs less than the one bought from water resellers. On the other hand, the standpost provides safer water than most of the the wells.

The advantage of rehabilitating the systems to AdB is the decrease of water leakages and wastage, as the community is aware, that the more they waste the more they will pay.

Continuous contacts are held with the communities in order to get them organized for improvement of the public water supply services. All leaking and malfunctioning standposts shall be disconnected and the sypply can only continue after the community takes the responsibility for the supply.

2.3.3 Conclusion/Recommendations

Final results of the rehabilitation in Pioneiros can not yet be presented, but the reactions and attitudes of the users, during and after the contacts, speak for the following conclusions and recommendations:

- Adoption of solutions (provisional as they can be) demands a long and patient dialogue between the company and the community in order to achieve the targeted results.
- The alternative solutions presented by the company ought to take into consideration the technical, commercial and socio-economic aspects.
- It must be remembered, that the community is potentially able to solve its own problems. Some advice and support must be given in accordance with the company's policy and strategy.
- We consider, that use of standposts in peri-urban areas must be encouraged and promoted as it is the cheapest way of supplying water to thousands of people.

AGUAS DA BEIRA
Water Loss Programme

PRESSURE FOLLOW UP REPORT

Results of the pressure follow up using recorders connected to the water network in different parts of Beira Town.
Weekly maximum pressure and distribution times.

RECORDER LOCATION	WEEK n:o																								
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26
1. Chaimite (City)																										
Pressure max (bar)	0,0	0,4	0,2	0,0	0,0	0,0	0,2	0,0	0,2	0,0	0,2	0,2	0,1	0,1	0,2	0,1	0,1	0,2	0,1	0,1	0	0	0,1	0,1	0	0,1
Distribution time (h)	0	47	46	0	0	0	36	0	22	0	14	33	34	44	51	49	39	48	35	36	0	0	29	21	0	13
2. Matacuane																										
Pressure max (bar)	0,0	0,2	0,0	0,0	0,1	0,0	0,4	0,0	0,2	0,2	0,2	0,2	0,2	0,2	0,3	0,2	0,1	0,3	0,2	0,3	0,1	0,1	0,2	0,1	0,1	0,1
Distribution time (h)	0	50	0	0	19	0	44	0	20	29	29	34	32	36	44	44	36	46	34	37	28	37	32	25	29	40
3. Munhava																										
Pressure max (bar)	1,0	1,2	0,0	1,2	0,0	0,0	3,0	2,6	2,6	1,0	1,0	2,6	2,7	0,9	1,0	1,0	0,9	1,0	0,9	1,2	0,9	1,2	1,1	1,2	1,0	1,0
Distribution time (h)	45	54	0	17	0	0	56	36	44	42	37	43	39	45	49	51	44	45	36	39	31	37	39	26	33	41
4. Macuti																										
Pressure max (bar)	0,6	0,6	0,0	0,0	0,0	0,0	0,4	0,4	0,4	0,3	0,3	0,4	0,4	0,4	0,6	0,4	0,3	0,4	0,4	0,3	0,2	0,2	0,3	0,5	0,2	0,4
Distribution time (h)	58	50	0	0	0	0	49	37	35	39	38	39	37	45	48	48	37	47	34	39	30	38	39	25	33	39
5. Maquinino																										
Pressure max (bar)	0,7	0,6	0,6	0,0	0,0	0,0	0,5	0,4	0,4	0,4	0,4	0,4	0,4	0,5	0,6	0,6	0,5	0,6	0,7	0,3	0,2	0,3	0,4	0,6	0,6	0,6
Distribution time (h)	64	48	65	0	0	0	44	35	36	33	34	35	28	37	21	49	38	49	30	15	28	36	35	26	20	39
6. Macuti hospital																										
Pressure max (bar)	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,2	0,2	0,2	0,1	0,2	0,4	0,5	0,2	0,3	0,2	0,2	0,1	0,2	0,2	0,4	0,2	0,4
Distribution time (h)	0	0,0	0,0	0,0	0	0	0	0	0	26	25	28	29	23	48	48	36	47	28	37	28	37	32	25	28	39
7. Ponta Gea (Palacio)																										
Pressure max (bar)	0,7	0,0	0,0	0,0	0,6	0,0	0,8	0,8	0,0	0,0	0,4	0,6	0,5	0,6	0,6	0,6	0,5	0,5	0,5	0,9	0,3	0,8	0,3	0,6	0,3	0,6
Distribution time (h)	49	0	0	0	48	0	37	15	0	0	36	45	35	43	49	47	38	51	35	38	28	37	34	25	31	40
8. Macuti (Dom Carlos)																										
Pressure max (bar)	0,0	0,1	0,0	0,0	0,2	0,0	0,3	0,2	0,2	0,3	0,0	0,1	0,0	0,1	0,0	0,1	0	0	0	0,2	0	0	0	0	0	0,2
Distribution time (h)	0	30	0	0	48	0	43	13	25	34	0	13	0	16	0	27	0	0	0	22	0	0	0	0	0	9
9. Porto																										
Pressure max (bar)	0,7	1,4	1,2	0,0	0,2	0,0	1,0	0,6	0,4	0,4	0,4	0,6	0,5	0,6			METER STOLEN									
Distribution time (h)	60	66	71	0	21	0	47	37	40	35	38	39	36	41												
10. Macuti (Casa Risto)																										
Pressure max (bar)										0,1	0,1	0,1	0,5	0,5	0,4	0,4	0,2	0,2	0,4	0,2	0,1	0,2	0,2	0,2	0,1	0,4
Distribution time (h)										29	16	33	27	29	47	46	36	45	26	38	28	38	36	24	28	38

PRESSURE FOLLOW UP REPORT: 1.4.91 - 31.12.91

Results of the pressure follow up using recorders connected to the water network in different parts of Beira Town

Weekly maximum pressure and distribution times

RECORDER / LOCATION	WEEK no 14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50	51	52
1. Chaimite (City)																																							
Pressure max (bar)						0,5	0,3	0,3	0	0	0,5	0,4	0,4	0,4	0,5	0,4	0,4	0,4	0,4	0,4	0,4	0	0,2	0,2	0	0,2	0,2	0	0,2	0,2	0,2	0	0,2	0,2	0,2	0,2	0,2	0	0
Distribution time (h)						61	64	58	0	0	30	59	60	61	60	63	59	62	62	56	58	0	45	42	0	37	41	0	41	49	44	0	42	37	55	48	50	0	0
2 Matacuane																																							
Pressure max (bar)						0,5	0,3	0,3	0,5	0,5	0,5	0,5	0,4	0,4	0,3	0,3	0,4	0,3	0,4	0,3	0,5	0,4	0,3	0,2	0,2	0,2	0,2	0,2	0,2	0,2	0,2	0,2	0,1	0,2	0,2	0,2	0,3	0,2	0
Distribution time (h)						54	28	50	53	55	52	56	48	51	59	37	57	57	51	26	60	48	38	39	40	32	39	37	37	37	39	52	39	35	42	30	40	45	0
3. Munhava																																							
Pressure max (bar)						1,2	1,3	1,3	1,4	1,5	1,4	1,3	1,3	1,3	1,2	1,2	1,1	1,3	1,1	1,1	1,1	1,0	1,0	0,9	1,0	1,0	0,9	1,0	1,0	1,2	1,0	1,0	0,8	1,0	1,0	1,0	1,2	1,0	1,0
Distribution time (h)						60	62	67	63	62	54	58	57	59	64	65	56	64	62	54	61	48	47	44	46	46	43	42	41	38	43	44	38	42	46	43	48	40	45
4. Macuti																																							
Pressure max (bar)						0,7	0,6	0,6	0,7	0,6	0,9	0,9	0,6	0,6	0,6	0,7	0,5	0,6	0,8	0,6	0,6	0,6	0,4	0,2	0,3	0,4	0,3	0,4	0,6	0,5	0,4	0,5	0,4	0,5	0,5	0,6	0,5	0,6	0,6
Distribution time (h)						62	64	36	62	63	55	60	58	60	61	64	61	61	62	55	57	54	45	42	43	41	44	47	42	41	51	47	43	43	53	47	50	51	58
5 Maquinino																																							
Pressure max (bar)						0,9	1,0	0,9	1,0	1,1	0,9	0,8	0,9	0,8	0,8	0,9	0,8	0,8	0,8	0,8	0,8	0,8	0,7	0,6	0,5	0,6	0,6	0,6	0,6	0,7	0,6	0,6	0,5	0,6	0,5	0,6	0	0,6	0,7
Distribution time (h)						62	53	60	53	63	60	60	53	58	60	64	61	61	59	51	58	46	45	41	41	39	43	43	42	45	43	43	41	45	49	50	0	50	64
6 Ponta Gea																																							
Pressure max (bar)						0	0,1	0	0,3	0,3	0,2	0,2	0	0	0	0	0	0,1	0,2	0,2	0,1	0,2	0,1	0,0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Distribution time (h)						0	42	0	48	57	48	42	0	0	0	0	0	57	37	33	29	35	20	0,0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
7. Ponta Gea (Palacio)																																							
Pressure max (bar)						0,6	0,7	0,6	0,8	1,0	0,9	0,9	0,8	0,8	0,8	0,8	0,9	0,8	1,0	0,8	0,7	0,8	0,5	0,5	0,5	0,7	0,6	0,6	0,6	0,6	0,5	0,6	0,5	0,6	0,6	0,6	0,6	0,6	0,7
Distribution time (h)						59	59	62	59	62	60	61	57	60	62	64	61	61	61	39	58	53	46	44	46	40	41	42	38	43	38	42	38	47	49	47	50	53	49
8. Macuti (Dom Carlos)																																							
Pressure max (bar)						0,1	0,1	0	0,2	0,2	0,2	0,2	0,2	0,2	0,2	0,2	0,2	0,2	0,2	0,2	0,5	0,5	0,25	0,2	0,2	0,2	0,2	0,2	0,2	0,1	0,2	0,1	0,2	0,1	0,1	0,1	0,2	0,2	0
Distribution time (h)						58	32	0	46	57	61	60	53	55	56	56	61	67	57	55	62	51	49	44	41	30	40	35	34	32	33	28	47	29	31	33	40	29	0
9. Porto																																							
Pressure max (bar)						0,9	0,7	0,9	0,9	0,9	0,5	0,9	0,4	0,5	0,6	0,5	0,6	0,4	0,9	0,8	1,0	1,0	1,0	0,9	0,6	0,7	0,8	0,6	0,6	0,4	0,5	0,4	0	0,7	1,6	1,2	1,0	1,0	0,7
Distribution time (h)						57	84	73	67	73	70	77	41	57	73	82	80	72	76	68	64	63	63	44	53	60	53	51	48	48	49	61	0	45	61	61	57	49	60

SUMMARY OF REASONS OF LEAKAGES

AGUAS DA BEIRA

01.01.91 – 31.12.91

		MUNHAVA	CHOTA	MAVINGA	MUCHATAZINA	MASSAMBA	CHIPANGARA	INHAMUDIMA	MATACUANE	MACURUNGO	PALMEIRAS 1	PALMEIRAS 2	MACUTI	ESTORIL	ESTURRO	MAQUININO	CHAIMITE	PIONEIROS	PONTA GEA	VAZ	BAIRRO BAMBU	SAGRADA FAMI	AEROPORTO	VILA MASSANE	CHINGUSSURA	MANGA	TOTAL
EXTERNAL REASONS	11 Excavation	25	1	1	1		1	2	2						4		2	3	1						3	18	64
	12 Blasting	8																									8
	13 Another construction work	1						1									1	1	1							1	6
	14 Traffic or another load	23	5	5	1	1	1	9	6	3	1		3		9	3	6	1	5	3	2		2	2	6	10	107
	15 Effience of another pipes							1		1						1		1							1	1	6
	16 Mischief	17		1	2																					1	21
	19 Another external reason																									.	0
MATERIAL REASONS	21 Factory default																										0
	22 Damage during installation																										0
	23 External corrosion	19			1	2	2	3	3	1	2		2		3		2	1	2	2	3		3			6	57
	24 Internal corrosion	19	1	1	1			1	2	1	1		4	1	5	2	2	2	9	5			1	1	6	12	77
	25 Abrasion	28	2	4	4	6	4	2	3	3				1	6	7	3	6	7	5	2		3	1	10	15	122
	26 Unsuitable material	4														1				1						1	7
	29 Another material reason														1												1
INSTALLATION REASONS	31 Installation mistake					1																				1	2
	32 Insufficient support																										0
	39 Another installation reason																										0
DITCH REASONS	41 Depression of the pipe																										0
	42 Horizontal displacement								1						2												3
	43 Mistake in prefilling																		1								1
	44 Pressure of a stone	3																									3
	49 Another ditch reason					1																					1
OTHER REASONS	51 Damage during maintenance																										0
	59 Another approximated reaso																										0
UNKNOWN REASON	69 The reason can't be indicate	12			2	1		3	2	1	2		1		1	4	1		2	1	1				1	11	46
	TOTAL	159	9	12	12	12	8	22	19	10	6	0	10	2	31	18	17	15	28	17	8	0	9	4	27	77	532

WORLD HEALTH ORGANISATION:

WORKSHOP ON OPERATION AND MAINTENANCE OF URBAN AND RURAL WATER SUPPLY AND SANITATION

SWAZILAND REPORT

prepared by: Cyril B. Kanya, Clerk of Works, Rural Water Supply Board
and Patrick B. Dlamini, Health Inspector, Shiselweni Region Health Inspectorate.
SWAZILAND

DATE: November 5, 1993

REPORT ON THE OPERATION AND MAINTENANCE OF RURAL WATER SUPPLY AND SANITATION IN SWAZILAND:

1.0 INTRODUCTION:

This report deals only with the rural water supply and sanitation because the water sector in Swaziland has the Water And Sewerage Board, which deals with urban water supply and sanitation affairs and the Rural Water supply Board (RWSB), which deals with rural water supply and sanitation affairs in partnership with the Ministry of Health, Health Inspectorate (HI) unit. The report is broken into the following sections:

(i) Organisational Structure
(ii) Background and History
(iii) Existing Operation and Maintenance Practices
(iv) Community Training and Participation in Operation and Maintenance of water supply and sanitation
(v) Technology Level
(vi) Demographic Data on Water and Sanitation Related Diseases
(vii) Funding for Water Supply and Sanitation Projects
(viii) Prominent Problems
and (ix) Future Plans.

It should be noted that the Water and Sewerage Board has both water supply and wastewater disposal networks and treatment works in the cities of Mbabane and Manzini and also in all the major towns in the country. They often have problems with shortage of water especially in the dry season and this is rectified by imposing rationing in the form of banning the use of garden hoses to water gardens, to wash cars and they also deal distribute pamphlets on water saving practices. They are also with water losses from leaks and other unaccounted for water. This Board is currently in the process of privatisation. The Board has an O&M section in all the towns and cities.

The country is divided into 4 administrative regions; Hhohho, Lubombo, Manzini and Shiselweni and can also be divided into 4 climatic regions; Highveld, Middleveld, Lowveld and Lebombo Mountain Range.(see fig.1 and fig.2)

2.0 ORGANISATIONAL STRUCTURE:

The Government of Swaziland (GoS) has the following ministries which deal with water supply and sanitation:

a) Ministry of Housing and Urban Development, in charge of the Water and Sewerage Board,which deals with water supply and sanitation in all the cities and towns;

b) Ministry of Health, in charge of the Health Inspectorate Unit which deals with sanitation in rural areas;
and c) Ministry of Natural Resources and Energy, in charge of the Rural Water Supply Board, Water Resources Department and

the Department of Geological Survey and Mines (DGSM). These three departments work hand in hand with the RWSB to provide water supplies to rural communities.(also see fig. 3. and fig.4).

The RWSB is in the process of institution building in the O&M section. The section is being formalised and is being decentralised. It has a central maintenance unit which deals with major maintenance work and regional sections which deal with minor work and preventative maintenance work. The latter are the ones which are currently being set up. The RWSB is being assisted in this exercise by a United Nations Development Programme (UNDP) sponsored consultant who has already produced two reports over the past two years.

3.0 BACKGROUND AND HISTORY:

The RWSB was started in 1975 as part of the Water and Sewerage Board but was separated in 1979 and charged with the responsibility of providing water supply and sanitation to rural communities. To achieve this goal, the RWSB set up construction depots at the main towns in each of the 4 administrative regions and a headquarters in Mbabane, the capital city. The O&M section of the RWSB was originally the most predominant section because the RWSB had only just started constructing water supply schemes. The schemes which were being maintained at that time were private schemes and schemes which belonged to institutions like rural missionary schools and clinics. Maintenance work was also carried out for farmers and rural government departments.

The RWSB has now built 270 water supply schemes for as many small rural communities of various sizes. The schemes which have been built vary in size. They are classified into micro systems for schemes with up to 5 public standpipes and macro systems for schemes with more than 5 public standpipes. Originally, the RWSB, only built water supply schemes and was more concerned with delivering quantity. The emphasis then shifted from quantity to quality. At this time the sanitation aspect was introduced and the RWSB no longer starts building any water supply schemes without the HI unit checking if the recipient community has reached an acceptable level in the construction of pit latrines and have been well trained in exercising sanitary and hygienic habits.

The RWSB and the HI unit are the main implementing bodies for rural water supply and sanitation work in Swaziland. Their organisational structures are shown in figures 4 and 5. The HI unit also deals with other health related duties like epidemic control and health education.

4.0 EXISTING OPERATION AND MAINTENANCE PRACTICES:

The O&M of rural water supply schemes is carried out at three levels ie.

(i) RWSB Central Maintenance Crew level,
(ii) RWSB Regional Maintenance Crew level,
and (iii) Community Based Pump Operators/Water Minders level.

The RWSB currently has a central maintenance office and workshop at the Matsapha RWSB depot. The four regional construction depots also have a small O&M section which deals with minor maintenance problems and preventative maintenance within their regions. The community based O&M personnel deal with minor maintenance which can be said to be village level maintenance problems. The first people to deal with water supply problems are the community based personnel who report whatever they cannot deal with to the regional crews who in turn pass on problems which they cannot deal with to the Central maintenance section. Private concerns like manufacturers of pumps and motors deal with whatever the central maintenance crew cannot deal with.

The GoS presently assists communities by securing donors and loans for constructing water supply schemes. It also assists in maintaining the staff of the RWSB and other departments which form the water and sanitation sector. The GoS started off by funding all maintenance activities carried out by the RWSB but has now shifted the responsibility of funding RWSB maintenance activities to communities. This has been done by asking the communities to pay for operation costs like energy costs and also materials costs like replacement parts for broken down parts of the water supply schemes. The GoS still pays for RWSB labour and transport costs.

The RWSB is now trying to push projects through the Ministry of Economic Planning and Development for rehabilitating certain water supply schemes which no longer meet their requirements and would be too costly for rural communities to fund themselves. Donor funding is also being sought for this exercise. The RWSB is pushing for the GoS to fund most of the work though. This will have the advantage of it having a recurrent budget for work which has already been identified as being too costly for the communities.

The HI Unit monitors the condition of pit latrine conditions through their community based Rural Health Motivators (RHM) who make physical inspections and visit community members and advise them on improvements or repairs required. The GoS, through the HI Unit, subsidises the construction of the pit latrines for individual homesteads

within communities. The operation (use) of the pit latrines is monitored through reports from rural clinics where sanitation borne diseases are detected and epidemics are curbed.

5.0 COMMUNITY TRAINING AND PARTICIPATION IN OPERATION AND MAINTENANCE OF WATER SUPPLY AND SANITATION PROJECTS:

The RWSB and the HI Unit carry out formal training seminars and workshops for communities prior to handing over water supply schemes. The training is for water committees on management of their schemes and also for Water Minders and Pump Attendants on O&M of their water supply schemes. The Water Minders and Pump Attendants are always involved in the construction of the water supply schemes from the beginning to the end. They get to know all aspects of their water supply schemes that way. On the sanitation side the RHM are also involved throughout the construction of pit latrines. They assist all the members of the community in building concrete slabs for their latrines and advise them on superstructures. They also keep community records for Health Inspectors and Health Assistants from the HI Unit. The HI Unit conducts training workshops and seminars for its staff and the RHM regularly to update them on the health status of their areas and the country as a whole.

The staff of the RWSB are regularly trained by pump , motor and pipe and fittings manufacturers in-country and in the Republic of South Africa (RSA). The local Pump manufacturers carry out tests on their products and are constantly coming up with improvements. they then communicate all their findings to the RWSB Headquarters staff including the Headquarters based Clerk of Works for O&M. New Technicians are hired from the Swaziland College of Technology (SCOT). These are mainly from the electrical engineering, construction, mechanical engineering and water technicians. The O&M section is composed mainly of Mechanical Engineering and Electrical Engineering Technicians. These have been trained at the SCOT and have also attended water and sanitation diploma courses in the UK with the Severn Trent Water Authority.

The staff of the HI Unit are mostly trained at the Institute of Health Sciences in Mbabane which works closely with the HI Unit and the other departments of the Ministry of Health. This institute is located next to the Swaziland Government Hospital, the main referral hospital in Swaziland. A number of the health Inspectors have also had training outside Swaziland in other African countries and also abroad. RWSB and HI Unit staff also get training from attending International seminars and workshops like this one.

6.0 TECHNOLOGY LEVEL:

The RWSB has used various types and makes of pumps. The first ones used were piston type positive displacement pumps followed by multi-stage centrifugal pumps and of late Brisan submersible pumps with a few mono pumps. The types of pumps used were based on the available types and makes at the time in Swaziland mainly from the RSA and also the types of sources that were considered acceptable by the RWSB administration at the time. At first surface water was considered suitable but that is no longer the case. Pumps are now avoided as far as possible. The present priorities are as follows in order of preference:

a) Natural Spring Sources
b) Mountain Streams (passed through slow sand filters)
c) Boreholes (with acceptable fluoride and chloride levels).

The size of the water supply scheme determines the type of source that the RWSB opts for. The larger the community the more probable that a pump will be used. In areas where there are neither mountain streams nor springs rivers are avoided because the RWSB has always had problems with pressure sand filters and chlorinators and so boreholes are drilled. The completed water supply scheme is designed so that the level of operation is suitable for communities to manage. Spring sources have very low maintenance requirements. Mountain streams with slow sand filters have more requirements but at a low cost to the recipient communities. Boreholes with electrically driven pumps have the highest maintenance requirements and they cost a lot more than the other types of water supply schemes. A shift to solar power is now possible because suppliers have already set up shops in Swaziland even though the capital cost is still three to five times more than the electrical equivalent. The RWSB with the Energy Department of the Ministry of Natural Resources and Energy will be replacing four diesel driven generator powered pumps for water supply schemes with solar powered pumps for assessment. This is still on the drawing board stage but should be in place by the end of next year.

The RWSB also installs small systems whereby boreholes are fitted with handpumps. During the early days handpumps were supplied by the original donor, the UK ODA. These pumps were mono pumps and Consallen pumps both manufactured in the UK and shipped to Swaziland with only a few spare parts. Most of these no longer work because the communities cannot afford to buy the spares from the UK. The RWSB later used mono pumps from the RSA. These have worked for longer periods because spare parts from the RSA were within the means of the recipient communities. This still proved very costly for the communities. Afridev pumps have now been ordered and are going to be installed all over the country. These come highly

/6

recommended and the few that have been installed by Non-Governmental Organisations (Emanti Esive, Council of Swaziland Churches and Swaziland Farmer Development Foundation, (NGOs) have worked very well and the communities seem to be managing them very well.

Communities also seem to be managing their slow sand filters very well because the RWSB laboratory keeps coming up with very good water quality results from schemes with them. This is therefore considered suitable technology for the communities thereby making the water supply schemes sustainable. This is the goal that the RWSB is striving for. The HI is using mostly pit latrines for rural homesteads. This is considered to be the most appropriate technology. The pit latrines are different throughout the country because the superstructures are wholly built by their owners. All the latrines are of the VIP type. The HI Unit assists the communities in constructing floor slabs and provide vent pipes with mosquito netting to cover the tops of the vent pipes. The owners are expected to replace the mosquito netting if and when it wears out and breaks. The HI staff advise communities on how to construct superstructures and they design and empty private and institutional septic tanks.

7.0 DEMOGRAPHIC DATA ON WATER SUPPLY AND SANITATION RELATED DISEASES:

At the time of preparation of this report the relevant officers with this data could not be contacted. The database for this data could not be read. It can be said though that the rural clinics have a lot of data which has been collected for more than ten years. This has shown clearly that the areas without proper sanitation have higher incidence of water and sanitation borne diseases. The areas which have been supplied with community water supply schemes and proper sanitation facilities have had sharp declines in reported cases of water borne diseases. This data is used to identify communities which need the most urgent attention as far health education and water and sanitation funding is concerned.

8.0 FUNDING FOR WATER SUPPLY AND SANITATION PROJECTS:

The RWSB is a GoS department which is not an income generating body. The communities that it serves do not have enough money to pay for the construction of their water supply schemes. The RWSB depends entirely on the GoS and foreign donors for funds to build water supply schemes. For the GoS to fund a water supply scheme, though, the recipient community hs to show its commitment by establishing an ever increasing O&M fund long before the RWSB builds the scheme. The NGOs which also fund and build water supply schemes also have the same policy. The main source of funds for water supply schemes are

foreign donors like the UK ODA, UNDP, USAID, CIDA and EC EDF.

The GoS also funds some schemes at a smaller scale than the previously mentioned donor agencies. NGOs also provide funds for water supply schemes and they assist the communities in building them. This is done according to RWSB standards which are in turn based, as close as possible, on WHO standards for rural water supply schemes. Originally the sanitation aspect was wholly funded by the GoS but now it is being included in the project documents for water supply and sanitation schemes.

9.0 *PROMINENT PROBLEMS:*

9.1 Technical:

The RWSB has already noticed that the schemes which were built between 1975 and 1985 are now becoming inadequate for the communities they serve either because they are now too small or because they are using obsolete materials and plant and are therefore badly in need of rehabilitation. A project to remedy this has already been submitted to the relevant ministry for approval. The initial rehabilitation proposal is for E 2 570 575.00 which is equivalent to approximately US $ 760 000.00. This would involve the rehabilitation of 88 micro and macro schemes. The user pay system has been at the back of the RWSB mind for a long time now. This may be the option to use for future rehabilitations. This would be difficult, though, because some communities find it difficult to meet the operation costs like electricity bills. This is at a monthly rate averaging about E 8.00 (US $ 2.40) per month per homestead.

The old handpumps from the UK now fall under the above. The other problem which is predominant in Swaziland is that the country has a very high lightning strike frequency rate. This has caused communities to lose a lot of money replacing motors for their pumps. The submersible pump motor manufacturer, Franklin Electric (RSA) has only last year come up with their own phangle control panel which has, so far, proved quite efficient. The operating costs of these systems are still quite high though. Ways and means of reducing these costs are being sought all the time.

The main problems that are worth noting as far as pit latrines are concerned are that the owners tend to use the cheapest available materials which are in many instances not structurally sound. Their superstructures therefore collapse quite often. The other problem is one of pits that collapse. This happens in certain areas within communities. The correction of this tends to be quite expensive for community members in those areas because they have to line their pits. The other problem that the HI Unit has to deal with is that of community members ignoring advice on building seats and covers for their latrines. Some of them just leave the latrine floor slab holes without covers. This causes flies and other insects to fly into and out of the pits.

9.2 Financial:

Dependence on foreign aid for construction of water supply schemes is not very good. More GoS involvement is needed as this will better meet the aspirations of the communities and therefore the GoS. The GoS is tries as far as possible to assist communities when they have struggled a lot. The rehabilitation project would be a big help to the communities who are now struggling with inadequate water supply schemes. The older schemes pose a great problem because the communities were firstly assisted by the GoS without any O&M funds. They are now finding it difficult to collect monies from community members who think that their Water Committees are trying to steal their money. The main financial constraint is due to the fact that the rural communities do not have any formal income generating activities. They depend mainly on subsistence farming.

The GoS and donors cannot be expected to fund operation costs and maintenance costs. The rural communities have to gently be introduced to user-pay attitudes. This, though , is being looked at as a future goal by the RWSB. It is currently deemed necessary to assist communities, especially those that fail while showing considerable effort. A lot of capital is being used to ensure that the communities are well trained in managing their water supply and sanitation schemes especially the financial management aspect.

9.3 Community Settlements:

The present system used by communities to settle does not have water accessibility as a major part of their criteria. the main requirement is that there should be enough land to plough and enough open space to graze livestock. The resettlement of communities is controlled by the Ministry of Agriculture and their main concerns are to curb overgrazing and to ensure that the people have enough land to plough. There are no formal villages but just communities under different chiefs and sub-chiefs (Indvunas). These settlements are such that the RWSB has to bring water to the people because the people did not settle where water was nearby. For managerial reasons the RWSB does not combine areas under different chiefs. This cannot be changed because of the financial and sociological costs of moving homesteads.

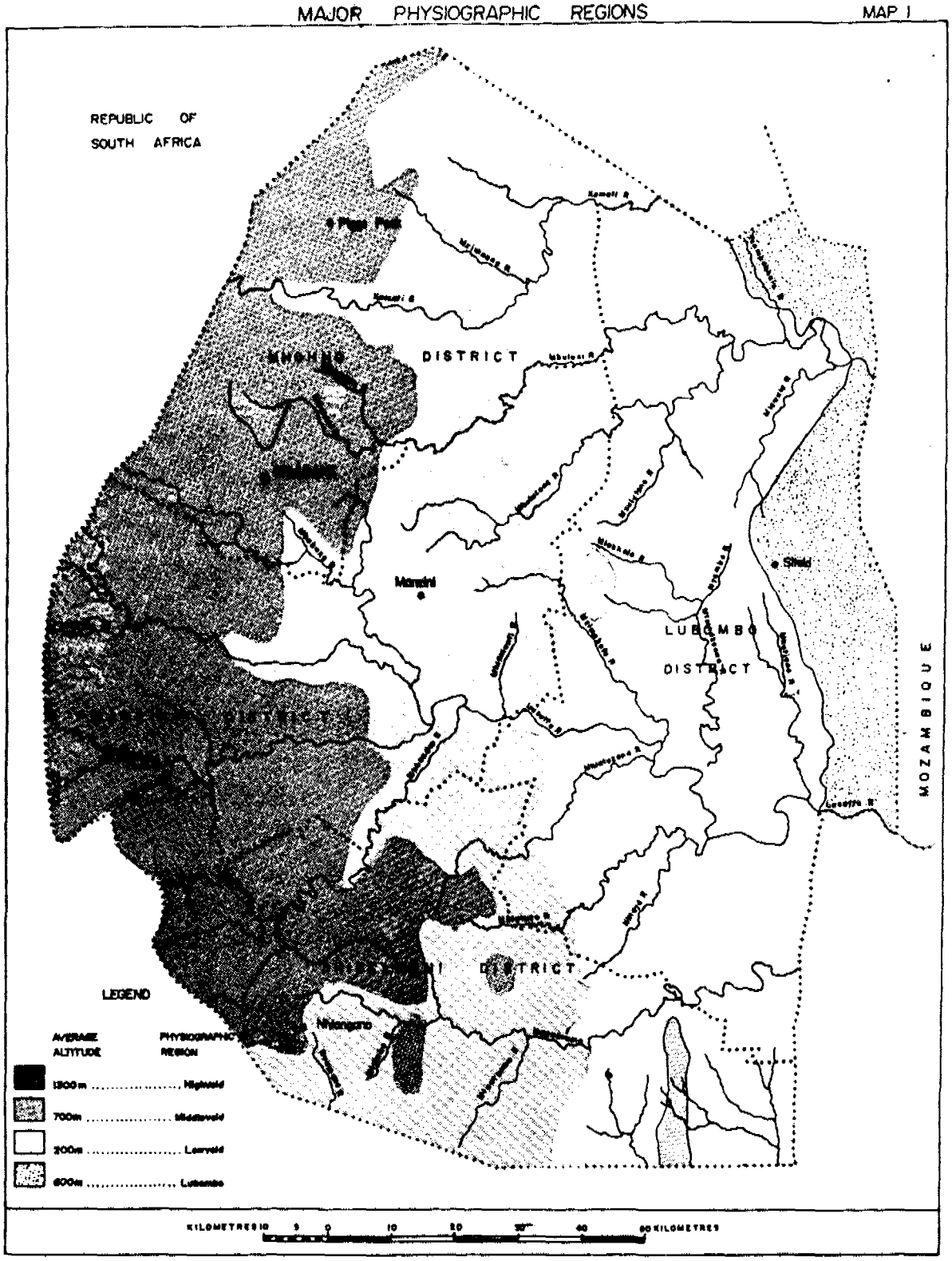
10.0 FUTURE PLANS:

The RWSB is currently more construction orientated than operation and maintenance orientated. This can be seen from the present organisational structure. The operation and Maintenance section only has a Clerk of Works while the other sections have Engineers. This is an error which needs to be corrected. The Planning and Construction Engineer has too much

on his plate. The maintenance section works closely with all the other sections but from a lower position. It is hoped that this will be changed so that the RWSB will have a O&M Engineer also. the present plan is that the Planning and Construction Engineer will change to *being a* Planning and Operations and Maintenance Engineer when the RWSB reaches a coverage of more than 50 % of the country's rural population. There are problems right now which need to be addressed at the highest level and so the section has to have more weight.

The RWSB has embarked on an exercise to update and improve its record keeping. A database is being put together for all the systems that have been built firstly by the RWSB and later by all the NGOs and even later by individuals. This is needed so that the RWSB can try and carry out water quality monitoring to WHO guidelines. It is also done to be able to carry out preventative maintenance more efficiently. The capacity for rural communities to operate and maintain their water and sanitation projects is being improved by numerous training courses and appropriate technology.

MAJOR PHYSIOGRAPHIC REGIONS MAP I



MAP III

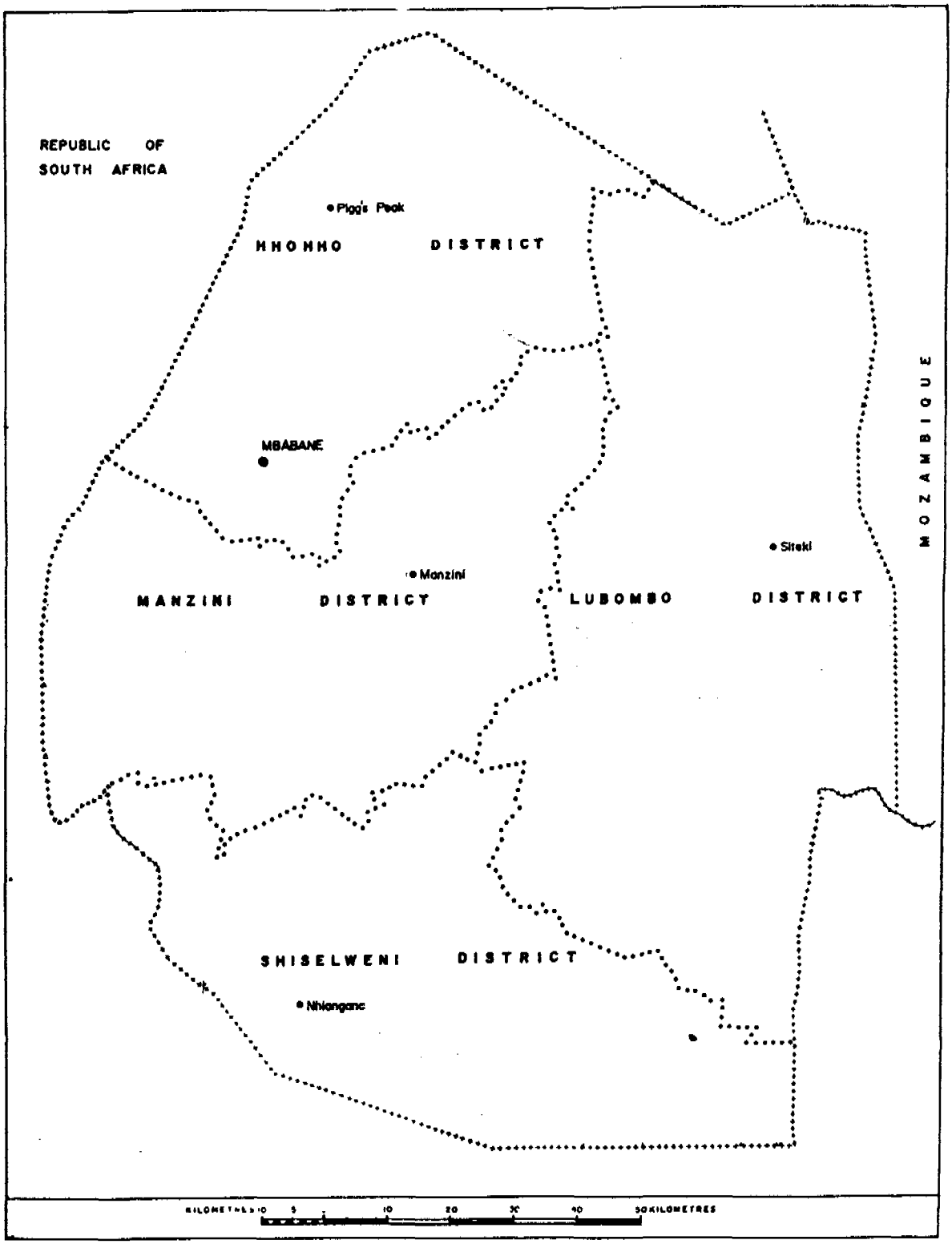
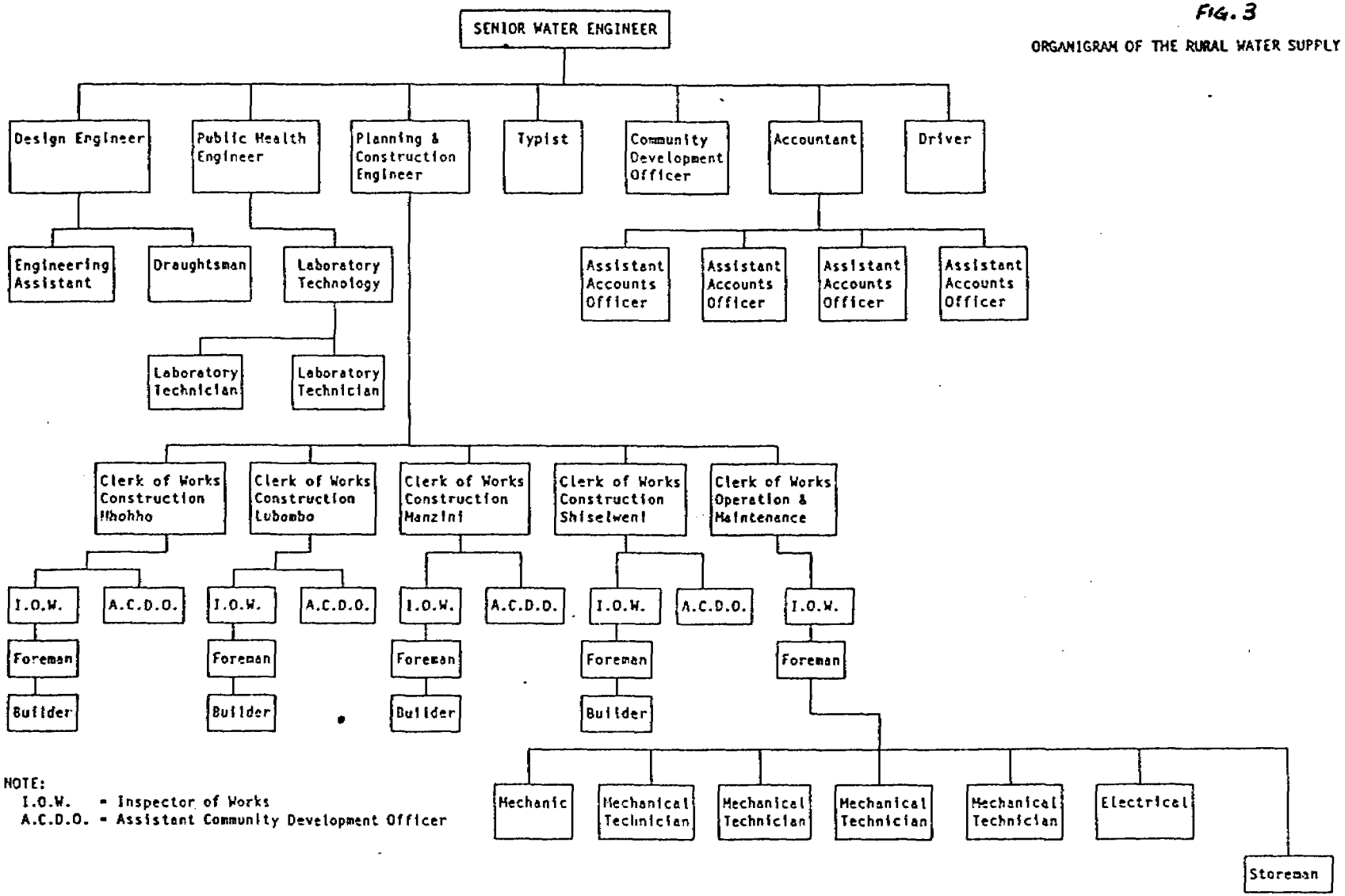

REPUBLIC OF
SOUTH AFRICA
Piggs Peak
HHOHHO DISTRICT
MBABANE
MOZAMBIQUE
Siteki
Manzini
MANZINI DISTRICT
LUBOMBO DISTRICT
SHISELWENI DISTRICT
Nhlangano
10 5 0 10 20 30 40 50KILOMETRES

FIG. 3

ORGANIGRAM OF THE RURAL WATER SUPPLY BOARD



NOTE:
I.O.W. = Inspector of Works
A.C.D.O. = Assistant Community Development Officer

FIG. 4: ORGANIGRAM SHOWING WATER SUPPLY AND SANITATION SECTOR IN RELATION TO OTHER SWAZILAND GOVERNMENT MINISTRIES

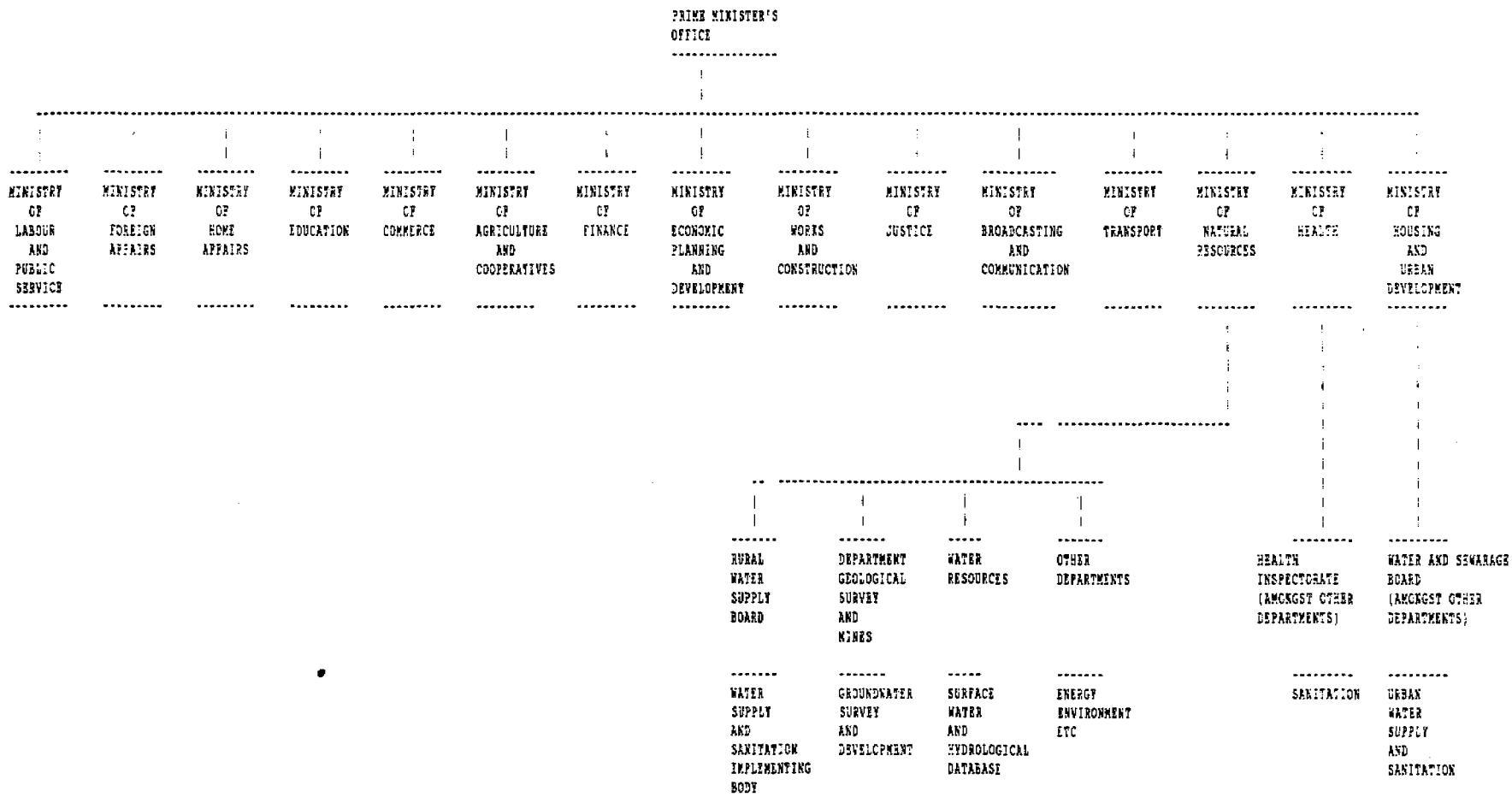
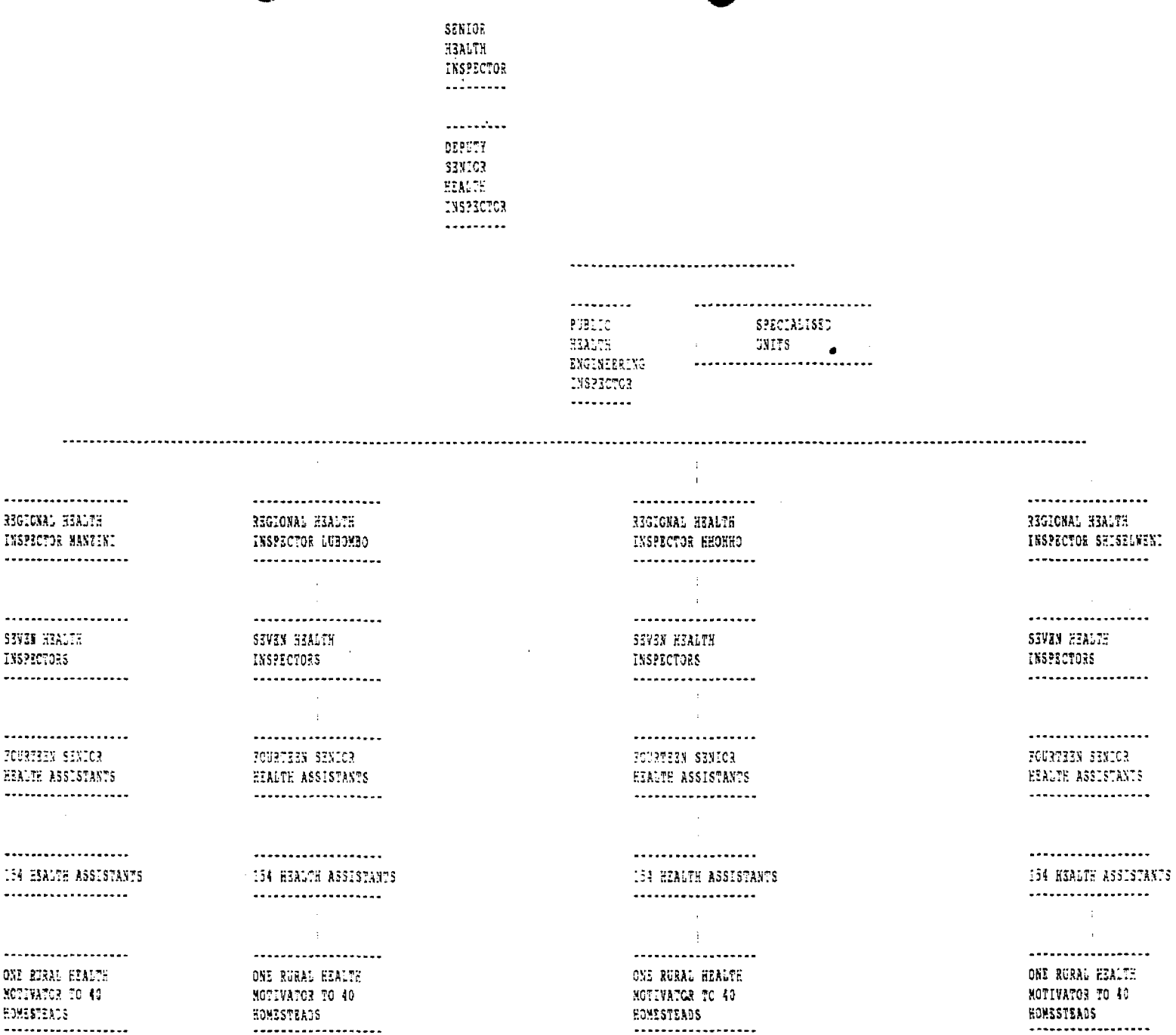


FIG. 5: ORGANIGRAM SHOWING THE HEALTH INSPECTORATE UNIT



UNITED REPUBLIC OF TANZANIA

COUNTRY PAPER PRESENTED

AT

THE SUBREGIONAL WORKSHOP

OPERATION AND MAINTENANCE OF RURAL AND URBAN

WATER SUPPLY AND SANITATION SYSTEMS

HARARE 8 - 12 NOVEMBER, 1993

ORGANIZED BY

WORLD HEALTH ORGANISATION

REGIONAL OFFICE FOR AFRICA

1.0 INTRODUCTION

After independence (1961), the Government's Water policies attempted to address the regional and urban rural imbalances in water development which were largely a result of consumers having to contribute by paying fees for water supplied to them.

In line with these policies, in 1965 the Government began financing all new investments. In 1970 it also started paying for operation and maintenance (O & M) costs and providing rural water services free of charge to the consumers. By that time the provision of water services was regarded as the responsibility of the Government whose objectives were to provide clean, potable water within a reasonable distance of every village as a free basic service, and to extend piped water supplies to within 400 m of every rural household by 1991 which has now been targeted at the year 2002.

The Government also embarked upon the implementation of a 20-year rural water supply program (1971-1991). During its second half of implementation, this programme coincided with the United Nations International Drinking Water Supply and Sanitation Decade (1981 - 1991).

At the same time the Ministry of Health launched a latrinisation campaign "Health for ALL in 1973 to counter the high incidence of faecal born diseases. The campaign requires that each household must have a latrine and use it hygienically. In 1982 the Ministry of Health set the target of achieving universal latrine coverage in rural households by the year 1991 which later on was extended to the year 1997.

2.0 THE PRESENT COVERAGE

Despite the noble goals and commendable achievements of past policies campaigns and programmes, many parts of the country still have an inadequate supply of clean and safe water. Todate about 46% of the 20.2 million rural population and 67% of 3.6 million of the urban population have access to reliable sources of safe and clean water. Results for the latrinisation campaign is encouraging. It is reported that about 85% and 90% of the house holds in rural and urban areas respectively are having latrines near home and are using them.

3.0 STATUS OF OPERATION AND MAINTENANCE

The decision of the Government in 1970 to pay for Operation and Maintenance costs and provide water to rural communities as a free basic service has caused water supply system to deteriorate. It was assumed that the Government would have enough resources for Operation and Maintenance and for new investments and run the facilities through its own institutions. It was later realised that adequate resources were not forthcoming and funding was biased towards new investments. This situation left most of the facilities not attended properly. Furthermore some of the projects required high technology for operation since their operation by villagers was not considered at the time of their inception. Such projects also stopped functioning because of high operation and maintenance costs. These two factors plus poor management has resulted in most rural water supply facilities being in operative. Presently it is reported that about 40% of the already completed water schemes in the country are in operative due to above reason and due to vandalism, defective pumpsets, worn out pipes or malfunctioning treatment plants.

4.0 FACTORS AFFECTING OPERATION AND MAINTENANCE

Among the factors which adversely affecting operation and maintenance activities in the country includes:-

4.1 ~~Public~~ Government ~~Funding for Operation and Maintenance~~ former policy on operation and maintenance

In the past decades the water supply and sanitation projects were completely owned by the Government from the formulation stage up to operation and maintenance stage and beneficiaries were expected to enjoy the services free of charge. The Government used to initiate the project ideas in any zone based on its own criteria. The criteria used by the Government often led to giving the service to the less priority community. This is because the project was formulated without any consultation with the beneficiaries. During the implementation of the projects, the Government funded all the construction costs and the labour from the Community was paid for by the funds set aside by the Government. In this way the project beneficiaries and the community at large never participated in the construction of the project.

For operation and maintenance, when the project implementation was completed the Government employed and posted operators to run the projects. The Government continued to incur all operational and maintenance costs interms of spareparts, fuel and salaries. There was no cooperation between project operators and the community. Community on the other hand never cared about project property because it was considered a project belongs to the Government. Destruction of project properties by the villagers was common as nobody felt responsibility for the project property. As a consequence to this many projects previously completed got destroyed and a lot of them stopped functioning.

4.2 Funding for Operation and Maintenance

As the country economy declined in the past decades funding for the sector has become the most critical constraint. The government has been allocating about 42% and 11% of the requirement for operation and maintenance and for new investment respectively. This has caused several projects which had been getting funds from the Government to stop functioning and others to operate below capacity and hence decreasing the efficiency on Operation and Maintenance.

Funding for O & M has also been affected by the Government priority setting. The priorities between construction of new schemes, rehabilitation, operation and maintenance have been biased towards building new schemes which soon became inoperative due to lack of adequate resources for O & M.

4.3 Choice of Technology

In the past, during the implementation of the projects, the type or the choice of technology to be used was not given due by the Government because it was assumed that the good economic situation of the country will continue and the Government will continue to employ operators to run the projects. Therefore the technology which was used in most of the projects was too sophisticated to an extent that a normal village cannot operate. Many schemes in the country were fitted with motorised pumping equipment which have high operational costs in terms of fuel and spareparts.

4.4 Lack of Trained Personnel

Due to the shortage of professionals such as civil, mechanical and electrical engineers, O & M activities are now managed by technicians.

Besides the fact that the existing professionals lack management and communication skills, specialization to cope up with the rapid technological changes is also lacking.

4.5 Inadequate Data on Operation and Maintenance

Operation and Maintenance activities of water supply schemes are highly affected by lack of proper operation and maintenance manuals and guidelines especially in projects which are implemented under direct labour arrangement. For contracted schemes available guidelines manuals are not usually made available to operators. Furthermore non standardization of water equipment and materials has caused difficulties in maintenance, stocking of spareparts and material and interchangebility. The current practices has been to ask for the required data from the regions/district whenever the need arises.

4.6 Lack of community involvement

Absence of community involvement, particularly that of women, has resulted into poor operation and maintenance of the projects. Women are the ones who suffer most when searching for water. But at the same time they are in a better position to influence men and children toward participation in water projects. Absence of their involvement in the water affairs results in no sense of responsibility on the part of the community for the water projects. Consequently incedences like vandalism, thefts, leakages etc. goes on unreported. Their involvement is therefore very significant.

4.7 Inadequate health education

Poor use and maintenance of sanitation facilities is to some extent due to inadequate health education. There are also several tribal taboos which hinder proper use of sanitation facilities. Such situation will definitely affect the amount of effort an house hold puts in making ensuring that sanitation facilities are maintained and operated fairly well.

5.0 STEPS TOWARDS IMPROVED O & M OF WATER SUPPLY AND SANITATION SYSTEMS IN THE COUNTRY

As it has been clearly shown, the Government has no enough resources to continue financing for O+M costs of Water Supplies. Apart from problem of finances, the past experience during the implementation of Water and Sanitation programmes has shown that projects implemented by the Government without involvement of beneficiaries are not sustainable in the long run.

5.1 New Government Policy for O+M

As a move towards improved Water and Sanitation Development in the country a National Water Policy was officially launched in Nov, 1991. This policy, is an official guide for Water and Sanitation activities in the country. The policy aims at encouraging people to construct, operate and maintain their own water schemes, increase health and productivity to the population by providing safe and adequate water supply and sanitation services. It also highlights the major concepts of beneficiary participation, sustainability, community based management.

On the other hand the National Action Plan on Universal Sanitation coverage has been developed and endorsed by the Government with the aim of achieving the Universal Sanitation Coverage by year 1997. The plan focuses on Community mobilization for self financing and management, provision of sanitary latrines monitoring and evaluation.

5.2 Funding for Operation and Maintenance

It has now been decided officially that beneficiaries pay for the water they use. Studies are now in advanced stages for the government to transfer management of water schemes to the beneficiaries. In fact in few cases, especially in ESA's and NGO's supported areas, Communities have started to manage their own water and sanitation schemes.

For the Urban Water Supplies the Government has introduced a system where Urban Water Supplies are supposed to be self sufficient through improvement revenue collection and improved management. This is a change from previous system where revenue collected used to go to the governments general revenue account while funds for operating costs used to come through government budgetary allocation.

5.3 Appropriate technology

The technology which was used in many projects was too sophisticated such that a normal villager failed to apprehend. As stipulated in the Water Policy, simple and appropriate technology should be applied whenever possible.

5.4 Data on Operation and Maintenance

The current practice has been to ask for the required data from the regions/district whenever the need arises. The set back to this system, is in the delay of getting the required information. With the support from UNICEF a joint sector monitoring system has been developed since 1991 within three key Ministries of Water, Energy and Minerals; Health and Community Development, Women Affairs and Children. The monitoring system will facilitate immediate generation of information/data. As a follow up to this, sector monitoring units have already been established in the three Ministries.

5.5 Use of simple construction materials

To facilitate construction of improved sanitation facilities, simple and inexpensive construction materials have been researched on and are now being propagated throughout the country.

3.1 Involvement of Women and Community

To enable full participation of the community in the water and sanitation activities, committees have been formed in most of the villages. In these committees of about six people, it a requirement that women membership must be half of the total members. Through these committees community participation is now sufficiently enhanced.

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OPERATION AND MAINTENANCE OF RURAL AND URBAN WATER SUPPLY

THE ZAMBIAN EXPERIENCE

P. MPANDE

S.F. SHISALA

MINISTRY OF ENERGY AND WATER DEVELOPMENT

ZAMBIA

NOVEMBER, 1993

PART I

THE RURAL SITUATION

BACKGROUND

Zambia is predominantly rural in its population distribution even though it is rated among the most urbanised country in the Sub-Saharan region. The reason for high urbanisation is due to rural urban drift of people seeking employment in the urban areas.

According to the 1990 Census of population, housing and agriculture Zambia had a population of 7,818,442 out of which 4,532,681 live in rural areas. This represents 58% as rural population (See appendix I for population distribution).

From 1969 the rural population has been on the decline from 70.6% to 60.1% in 1980 and 58% in 1990. Appendix II shows the percentage of rural population by Province and over all.

Statistics on population trend from 1969 to 1990 are reflected at Appendix III.

The economic activities in rural areas of Zambia vary from Province to Province, but agriculture is most dominant. In terms of employment about 42% of all women and 40% of all men in the rural area are employed in the informal Sector. Child mortality has been a great concern to the Government. The major causes are water related diseases such as diarrhoea diseases. These diarrhoea diseases have not only affected children but also adults. Recently cholera out breaks in the country claimed many lives. The situation caused great anxiety in the country - hence the need to improve the Water supply and sanitation both in rural and urban areas.

CURRENT SITUATION

In the rural areas of Zambia the main sources of water supply are point supply systems, namely hand dug wells, boreholes, springs etc. Statistics on real situation as regards to the rural water supply, is not reliable. It is however, estimated that there are 10000 point supply systems that could be put to use.

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It is further estimated that about 50% of the installations are operational. The other 50% are not in use either due to breakdowns or abandonment. The coverage of 200 people per well point is assumed in Zambia. From the estimated 10000 well points it means that only 2,000,000 people have access to clean and safe water. But due to the assumed 50% breakdown situation only 1,000,000 people will have clean and safe water. This represents only 22% coverage for people with safe and clean water in the rural areas. The situation is indeed worrying.

The high rate of malfunctional well points is due to little attention given in the operation and maintenance. The result is that breakdowns follow after a few months of operation after installation. There are many reasons linked to too little attention given in the operation and maintenance of the rural point supply systems some of which are:-

- No comprehensive inventory systems
- Too many players in the sector but with little or no co-ordination.

INSTITUTIONS RESPONSIBLE FOR RURAL WATER SUPPLY SYSTEMS

DEVELOPMENT

Until recently, the Department of Water Affairs has been the major player in the development of Rural Water Supply Systems. Other players now involved in the development of Rural Water Supplies are:-

- Ministry of Local Government and Housing
- Ministry of Health
- Ministry of Social Welfare and Community Development
- Donor Agencies
- Non-Government Organisations

Due to lack of clear guidelines these organisations or institutions have been operating almost independently of each other. A high degree of confusion resulted and caused a lot of overlaps in responsibilities. Communities have been in the past overlooked in decision making pertaining to projects brought to their areas.

OPERATION AND MAINTENANCE

Presently there is no clear policy as to which institution or organisation should be responsible for the operation and maintenance of Rural Water Supply Systems. The practice has been that the Department of Water Affairs develops the systems and hands over to the local authority or responsible institutions for operation and maintenance. However, due to lack of capacities at local authority level and responsible institutions, the Department of Water Affairs is still performing both responsibilities of development and maintenance of the systems.

For systems constructed by donor agency and Non-Governmental Organisations, the communities are in principle required to take charge of operation and maintenance. Due to lack of skills and capacity, communities are unable to maintain the systems. The Department of Water Affairs ends up taking the responsibility of the systems.

At times it may not be clearly stated what role the community has to play in the project especially when projects are undertaken during emergence situation such as drought or floods. Communities feel it is government responsibility for such projects. This leads to projects falling in disuse shortly after construction as nobody cares for their maintenance.

TECHNOLOGICAL ASPECTS

Zambia like many other developing countries has had no choice in deciding the type of technology that could suit her local conditions. Each funding agency has been independent in deciding pumps or equipment to use.

This autonomous situation has resulted in no many makes and models of handpumps. This makes it difficult even to amke simple repairs because parts are not interchangeable. The situation renders many installations unusable in that they can no longer be repaired until the correct spare parts is procured.

To solve the problems just described, the Department of Water Affairs attempted to standardise the India Mark II which proved efficient over a period of use. The attempt has not been entirely successful due to many reasons including:-

- Different India Mark II models which are not compatible and parts not interchangeable
- Donors have continued to select their own technology in pumps and equipment used.

Clear policy on the choice of technology will enhance standardisation. The result will be obvious. To ease up spare parts problems.

HEALTH ASPECTS

Because many people (rural) have been used to traditional water sources it takes sometime for them to be convinced on the benefit of using water from a protected source such as a borehole or lined dug well. In Zambia the Ministry of Health through the primary health care programme are educating the community on the benefits of using water from protected water sources. As regards to policy and guidelines there is no such policy on health education in the sector.

FINANCIAL ASPECTS

The development and construction of Rural Water Supply proejcts are at present fully financed by the Central government, donor agencies and Non-governmental organisations. Community contribution has recently been recognised and has mainly been in terms of labour and local material at the construction phase of the project.

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Operation and maintenance has not been on cost recovery basis. The government has been fully in meeting expenses for maintaining the systems. The current financial constraints have made life difficulty in the government meeting its social obligations.

PROBLEMS IN OPERATION AND MAINTENANCE

The following problems have been identified in the operation and maintenance of Rural Water Supply Systems:-

- Lack of co-ordiantion among key players
- lack of Policy and institutional capacities
- Lack of standardised technology and information for educational campaigns
- Inadequate community participation
- Organisation problems i.e. transport, manpower etc.
- Financial constraints and operating on Non Cost Recovery basis
- Lack of attention to sanitation and inability to include sanitation in Rural Water Supply proejcts.
- Lack of standardisation
- Lack of monitoring after project completion
- No comprehensive data on Rural Water Supply Systems

NEW DIRECTION

Having recognised the problems in the Water Supply and Sanitation Sector, the government of Zambia started thinking the direction of reviewing the Water Supply and sanitation sector.

The first move has been to improve co-ordination among the key players in the sector in order to accelerate the implementation of planned projects and to rehabilitate existing infrastructure. Secondly the government initiated studies leading to a more efefctive organisation of water supply and sanitation sector.

The Task Force and Programme Co-ordinating Unit (PCU) have been established to undertake the first and second initiatives respectively.

In addition to the establishment of the Task Force and PCU, Community Management and Monitoring Unity (CMMU) has been set up under UNICEF. The CMMU will be responsible for community mobilisation and monitoring of Rural Water Supply and Sanitation systems and make inventories and thus create a data base.

RECOMMENDATIONS

Having identified the problems in the Rural Water Supply the following recommendations are made to bring about sustainable Rural Water Supply systems:-

- Community participation must be an integral part of Rural Water Supply systems. Formation of Water committees will ensure smooth and effective community participation.
- Standardisation in design, construction and pumping technology should be encouraged. Once in place the question of spare parts will not arise. Production of teaching material for public awareness will also be simplified.
  Users views should be taken into account when standardisation is implemented. Research and learning institutions should be involved in coming up with the appropriate technology to be standardised.
- Community education and water awareness programmes should be encouraged. This could be achieved through the media, theatre etc.
- Capacity building at community level through training of trainers should be carried.

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- Communities should be involved in emergence programmes to ensure smooth take over for follow up maintenance.
- Part of investment cost for Water Supply and sanitation projects should be met by the communities. In this way the communities will develop a sense ownership of the projects.
- Cost recovery should be encouraged through Water Committees
- Information flow on Rural Water Supply should be developed so that quick action is taken to undertake repairs of malfunctional installations.
- Preventive maintenance should be part of routine work by institutions responsible for Rural Water Supplies
- Comprehensive policies and legal framework should be quickly put in place to provide guidelines and enforce the former to develop sustainable Rural Water Supply Systems.

CONCLUSION

Many Rural Water Supply and sanitation programmes have not been very successful. Various reasons are attributed to the failure of the programmes but the two cardinal factors are lack of maintenance and lack of active community participation. The community should be involved at all levels of project implementation with systematic preventive maintenance programmes developed.

Standardisation in design, construction and pumping technology needs serious consideration. With standardisation in place the situation of lack of spare parts will not arise.

Finally the Government should quickly put in place policies and strategies to yield sustainable projects. It will help the situation for donors and NGOs to follow the guidelines especially selection by following the standards recommended.

PART II

THE URBAN SITUATION

CURRENT SITUATION

For the purpose of discussion the urban situation includes small twonships, Municipal Councils and City Councils. Although there are variations in service levels, the principles of operation and maintenance of the water supply and sanitation systems are basically similar.

Like in Rural Water Supply and Sanitation systems, statistics on the current situation are not readily available. However, the International Drinking Water Supply and Sanitation Decade (IDWSSD) secretariate prepared some data on the Water Supply and Sanitation systems whish still refered to in terms showing the current level of coverage. Appendix IVa - IVd reflects the current levels of coverage.

INSTITUTIONAL ARRANGEMENTS

Urban Water Supplies and sanitation systems are managed by the following institutions.

- Ministry of Energy and Water Development (45 township water supply schemes)
- Ministry of Local Government and Housing (Large townships, Municipal and City Councils)
- Ministry of Works and Supply (Schools, Military Camps and some district centres sanitation)
- Ministry of Health for primary health education and water quality surveillance.
- Ministry of Environment and Natural Resources (for establishment of standards for effluents into receiving waters).
- Private organisations such as ~~Ministry~~ Mining companies and Railways are responsible for areas of their operations.

- The National Commission for Development Planning (NCDP) is responsible for overall development planning, determination of intersectoral investment priorities and donor co-ordination.

MANAGEMENT OF URBAN WATER SUPPLY AND SANITATION SYSTEMS

Local authorities are mandated by the Local Government Aid of 1991 to suuply water to establish and maintain services for the disposal of sewage, solid waste and other effluents in areas of their jurisdiction.

Other institutions mentioned under institutional management manage the systems on Ministerial and Institutional guidelines. There is no clear policy as well in the Urban Water Supply and Sanitation Sector.

INSTITUTIONAL CAPACITY

The Urban Water Supply and Sanitation systems are not exempted from the problem of inadequate institutional capacities. The systems are currently substantially financed by External sources but beacuse of the problem facilities continue to deteriorate and consequently service levels continue to fail. Local authotities and other institutions have recognised some of the factors leading to inadequate institutional capacities and have now embarked on programmes to redress the situation. One of the most important measures is human resources development. Authorities in various institutions are now placing emphasis on human resources development.

FINANCIAL ASPECTS

INVESTMENT TREND

At present most of the financial resources invested in Urban Water Supply and Sanitation is from external sources. The little local funds available are allocated to the sector as counterpart funds and are tied specifically to intended projects. This makes it difficult for the Government to undertake emergence tasks such as attending to Chorela prone areas and

utilise part of funds invested in the systems.

It is important that the Government promotes some investment programmes to increase the share of investment in the Water Supply and Sanitation systems.

In this way flexibility in changing priorities such as varying expenditure to attend to emergence situation will be possible.

OPERATION AND MAINTENANCE FUNDS

The Central Government is still financing the operation and maintenance of most urban water supply and sanitation systems. This is done through grants to local authorities and divert funding to government run schemes.

The Government however, intends to phase out funding to Water Supply and Sanitation systems. This has started in the Department of Water Affairs by setting up revolving funds accounts for the schemes on regional basis. It is anticipated that by 1996 the schemes will be able to stand on their own.

One Municipal Council and one City Council have turned their water and sewerage schemes into companies. It is hoped that shortly most schemes will be autonomous.

COST RECOVERY AND SUSTAINABILITY

As mentioned above most water supply and sanitation schemes are still subsidized by Central Government. The existing tarrif structures coupled with high rate of defaulters do not generate enough income to meet operation and maintenance costs as well as investment costs.

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COST RECOVERY AND SUSTAINABILITY

As mentioned above most water supply and sanitation schemes are still subsidized by Central Government. The existing tarrif structures coupled with high rate of defaulters do not generate enough income to meet operation and maintenance costs as well as investment costs.

One suddening situation is that the revenue collected from the schemes have not been directed towards operation and maintenance. For Councils, it has been used to subsidize other operations. For the case of Department of Water Affairs schemes revenue has been deposited to the Central treasury. Funds for operation and maintenance are disbursed to various schemes under recurrent budgets (though not sufficient).

It is important to put in place a policy with respect to cost recovery for achievement of long term sustainability. Such a policy should include guidelines on many issues such as:

- Measures for timely settlement of bills
- Realistic tarrifs
- Public water awareness to curb vandalism, waste and to overcome the perception that water is a free commodity.

TECHNOLOGICAL ASPECTS

As discussed under Rural Water and Sanitation situation, technological problems are a common feature in the Urban situation as well. These range from lack of choice of equipment obsolete systems and lack of research activities etc.

There is need to address research issues serious and come up with appropriate technology for provision of sustainable systems.

GENERAL PROBLEMS AND CONTRAINTS

General problems in Urban Water Supply and Sanitation systems can be categorised as follows:

- Insufficient funding for many years leading into deterioration of systems and service levels.
- Lack of proper human resources development programmes
- Inadequate capacities in the systems
- Restriction in recruitment of professional and skilled staff.
- Technological problems, most equipment is obsolete. Some equipment is not appropriate for the Zambian situation.

RECOMMENDATIONS

- There is an urgent need for promulgation of a clear water and sanitation sector with guideline to achieve long term sustainable systems.
- A well articulated training policy should be put in place to enhance capacity building in the system.
- Increased funding from government to scheme before they achieve a self supporting level should be considered.
- Government should increase investment funding to allow for flexibility in terms of attending to emergency situations.
- Legal frame work to enforce the policy and guidelines should put in place.
- Technology aspects should be addressed to research in order to come up with appropriate technology for the Zambian situation in the sector.

CONCLUSION

The efficiency of the Urban Water Supply and Sanitation sector is far from being satisfactory. This is attributed by a number of factors, Prominent among them is the inadequate capacities, inadequate legislation, fragmented sector responsibilities, poor financing and lack of human resource development programme, to name but a few.

To redress the situation, a comprehensive and up to date policy has to be put in place with considerations given to the recommendations outlined above.

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3. National action Committee on International Drunk Water Supply and Sanitation Decade - Plan of action For Water Supply and Sanitation - Lusaka 1985

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APPENDIX I

POPULATION DISTRIBUTION

PROVINCE	URBAN	RURAL
CENTRAL	216023	509588
COPPERBELT	1428691	150845
EASTERN	85714	888104
LUAPULA	83036	443669
LUSAKA	1041473	166507
NORTHERN	123457	744338
NORTH-WESTERN	45599	337547
SOUTHERN	190384	755969
WESTERN	71383	536114
TOTAL	3,285,766	4,532,681

APPENDIX II

PERCENTAGE OF RURAL POPULATION

PROVINCE	1969	1980	1990
CENTRAL	81.4	70.4	70.2
COPPERBELT	8.8	17.7	9.5
EASTERN	97.3	90.3	91.8
LUAPULA	97.7	86.9	84.2
LUSAKA	22.6	20.2	13.8
NORTHERN	97.4	82.5	85.8
NORTH-WESTERN	-	86.5	88.1
SOUTHERN	87.2	75.2	79.9
WESTERN	97.7	83.1	88.2
NATIONAL AVERAGE	70.6	60.1	58.0

Table 1: Summary of levels of service (percentage of population) - 1980.

	Water supply coverage by area	Water supply coverage national	Sanitation coverage national
Large urban areas	70	23	17
Small urban areas	45	5	3
Rural areas	32	18	17
Total		46	37

Source; Plan of Action for Water Supply and Sanitation.

Table 2: Summary of Water Supply Services available

Housing	High Cost	Medium Cost	Low Cost	Rural
Service				
Multiple tap	*	*		
Single tap		*	*	
Commercial tap			*	
Wells and boreholes				*

Source: ibid

- Available water supply services are classified according to the housing categories served.

APPENDEX III

POPULATION TREND

	1969	1980	1990
POPULATION	4.0 Million	5.7Million	7.8Million
DENSITY pop/sq km	5.3	7.5	10.4
RURAL %	70.6	60.1	58.0
INFANT MOCTALITY RATE/1000	14.1	97	89.6
LIFE EXPECTANCY (Years)			
MEN	41.8	50.4	52.9
WOMEN	45	52.5	55