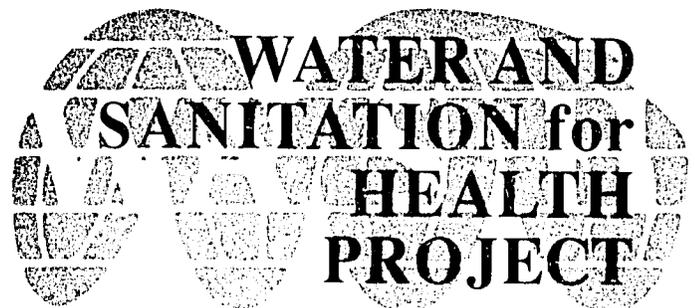


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# MOZAMBIQUE DROUGHT RELIEF PROPOSED WATER SUPPLY INTERVENTION

WASH Field Report No. 366  
June 1992



Sponsored by the U.S. Agency for International Development  
Operated by CDM and Associates

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# **MOZAMBIQUE DROUGHT RELIEF PROPOSED WATER SUPPLY INTERVENTIONS**

Prepared for the Bureau for Research and Development,  
Office of Health, U.S. Agency for International Development  
under WASH Task No. 374

by

Joseph Gadek

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# CONTENTS

ABOUT THE AUTHORS .....	iii
ACRONYMS .....	v
EXECUTIVE SUMMARY .....	vii
1. INTRODUCTION .....	1
2. NEEDS ASSESSMENT .....	3
2.1 Rural .....	3
2.2 Peri-urban .....	4
2.3 Urban .....	5
3. PROPOSED STRATEGIES AND TECHNOLOGY CHOICE ASSESSMENT .....	7
3.1 Rural Strategy .....	7
3.1.1 Water Supply Services .....	7
3.1.2 Sanitation Services .....	8
3.2 Urban and Peri-urban Strategy .....	10
3.3 Technology Choice .....	11
4. INSTITUTIONAL OPTIONS FOR IMPLEMENTATION OF POSSIBLE INTERVENTIONS .....	13
4.1 Direct Government Execution .....	13
4.2 NGO Management of Funds with PRONAR Execution .....	13
4.3 UNICEF Management of Funds with PRONAR Execution .....	15
4.4 Short-term Contract Employment within USAID .....	15
4.5 Private Sector Involvement .....	16
4.6 Short-term Technical Assistance .....	16
5. PRIORITIZED NEEDS AND RECOMMENDATIONS .....	17
5.1 Recommendations .....	17
5.2 Associated Costs .....	18

## APPENDICES

A. Maps of Mozambique and Provinces . . . . .	21
B. Rainfall Maps and Summary Graphs . . . . .	29
C. PRONAR/UNICEF Emergency Plan of Action—Drought 1992 . . . . .	39
D. Population Estimates . . . . .	69
E. Water Sector Organogram . . . . .	71
F. PRONAR Water Well Production, 1984-1991 . . . . .	75
G. GEOMOC Drilling Rigs Inventory in Affected Provinces . . . . .	79
H. PRONAR 1990 Production, Wells Development . . . . .	81
I. Schedule and Individuals Interviewed . . . . .	85

## ABOUT THE AUTHORS

**Mr. Gadek is a sanitary and environmental engineer with more than 15 years experience in the field. He holds a B.S. in Civil Engineering and an M.S. in Environmental Engineering. Mr. Gadek has worked with the World Bank and A.I.D. in several African countries including drought-prone countries such as Botswana and Ghana.**

## ACRONYMS

<b>A.I.D.</b>	<b>United States Agency for International Development (Washington, DC)</b>
<b>DNA</b>	<b>National Directorate for Water (Direção Nacional de Aguas)</b>
<b>DPCA</b>	<b>Provincial Directorate for Construction and Water</b>
<b>EPAR</b>	<b>Provincial Rural Water Supply Workshop (Estaleiro Provincial)</b>
<b>GEOMOC</b>	<b>State Water Drilling Corporation</b>
<b>HIDROMOC</b>	<b>State Hydraulic Equipment Company</b>
<b>MCA</b>	<b>Ministry of Construction and Water (Ministerio da Construção e Aguas)</b>
<b>MT</b>	<b>Meticais (local unit of currency)</b>
<b>NGO</b>	<b>Nongovernmental organization</b>
<b>OFDA</b>	<b>Office of Foreign Disaster Assistance</b>
<b>PAABP</b>	<b>Program for Peri-urban Water Supply</b>
<b>PEC</b>	<b>Participation and Education Program</b>
<b>PRONAR</b>	<b>National Rural Water Supply Program</b>
<b>UDAAS</b>	<b>Association of Water Companies</b>
<b>UNICEF</b>	<b>United Nations Children's Fund</b>
<b>USAID</b>	<b>United States Agency for International Development (overseas mission)</b>
<b>VLOM</b>	<b>Village Level Operation and Maintenance (handpumps)</b>
<b>WS&amp;S</b>	<b>Water Supply and Sanitation</b>

- Notes:**
- 1. Currency Equivalent: US\$ 1 = 2,280 MT (May 1992)**
  - 2. Fiscal Year: January 1 to December 31.**

## EXECUTIVE SUMMARY

Southern Africa is currently experiencing one of the worst droughts of the century, with southern Mozambique and Zimbabwe being the two hardest-hit countries in the region. A recent United States Agency for International Development (A.I.D.), Office of Foreign Disaster Assistance (OFDA) team of professionals visited 10 affected countries and reported that the situation is critical and requires assistance. Relief, however, must include more than food; efforts to mitigate the impacts of the drought upon water supplies are necessary as well.

To address the most critical water supply problems facing southern Mozambique, the Government of Mozambique, through its National Directorate for Water (DNA) has developed the *Emergency Plan of Action—Drought 1992*. The plan was produced by the DNA's National Rural Water Supply Program (PRONAR), the government agency responsible for the country's rural water supply, with assistance from UNICEF. The Emergency Plan identifies many areas in which donor funding is required to supplement the government's existing water sector budget.

The author of this report recommends that if funds are available within the USAID/Maputo office budget, as much as US\$ 3.34 million should be channeled into the water sector relief efforts in southern Mozambique. The primary conduit for implementing the recommended interventions would be through the UNICEF/Maputo office, which has recruited several international professionals concentrating exclusively in the water and sanitation sector.

It is absolutely critical that if assistance is to be given in the water supply sector that it be forthcoming *immediately*. Rainfall patterns have been well below normal for the last eight years in some parts of the country, with the current cycle seemingly a few years away from returning to the maximum part of the cycle. Because the next possible rains will not develop (normally) until November, the country faces six months of extreme difficulty. Every source that can be newly developed or rehabilitated may save lives between now and then. Even if the rains come as expected in November, it will take some time for the groundwater aquifers to recharge following the current extended drought. With this scenario in mind, a 12-month effort as outlined in this report is not unreasonable.

## Chapter 1

### INTRODUCTION

Southern Africa is now experiencing one of the worst droughts of the century, with southern Mozambique and Zimbabwe being the two hardest-hit countries in the region. Mozambique is currently in the midst of one of the most severe droughts in the past 50 years. Rainfall for the 1990-91 and 1991-92 rainy seasons has been well below average throughout the country. Particularly hard hit are the southern provinces of Manica, Sofala, Inhambane, Gaza, and Maputo (see Appendix A for map). A large portion of Tete Province has also been severely affected by the drought. Typically, the rainfall pattern in Mozambique would have the next rainy season beginning in November and running through to March.

Given the poor performance of the past two rainy seasons (see Appendix B for rainfall summary graphs), many surface water sources of potable water supply have vanished, and groundwater levels are dropping at alarming rates in the southern provinces. The National Rural Water Supply Program (PRONAR) within the National Directorate for Water (DNA), Ministry of Construction and Water (MCA), reports that in some districts up to 75 percent of the shallow sources (hand-dug wells) and 25 percent of medium-depth sources (hand-drilled wells) are dry or in imminent danger of drying up. The State Water Drilling Corporation (GEOMOC) also reports that static water levels of some of the most severely affected boreholes have dropped by up to 10 meters. Three of the country's primary urban centers, Beira (in Sofala), Chimoio (Manica), and Quelimane (Zambezia), currently face severe shortages of supply, and several others are approaching severe conditions. Beira's supply has already been hurt by saltwater tidal intrusion at the source of intake, some 50 kilometers from the sea, due to the extremely low level of the river source.

With technical assistance support from the United Nations Children's Fund (UNICEF), the DNA has compiled a well-developed planning document, the *Emergency Plan of Action—Drought 1992* (hereafter referred to as the Emergency Plan), to assist in addressing the short-term immediate problems of the water supply sector, as best they can be predicted (see Appendix C). One of the major problems in addressing both the food relief efforts and water supply measures associated with the drought is the dislocation of people created by those very factors, combined with a protracted civil war that does not allow the safe passage of food or water sector personnel and equipment in certain regions of the country.

In March, the Office of Foreign Disaster Assistance (OFDA) within the United States Agency for International Development (A.I.D.) fielded an eight-member rapid reconnaissance team to quantify the needs of the southern African drought relief effort. This report is based on the team's assessment.

In April, UNICEF/PRONAR submitted a request to A.I.D. for US\$ 2 million in emergency assistance for the rural areas most affected by the drought. A few nongovernmental organizations (NGOs) have also submitted proposals to USAID/Maputo that contain elements

of water supply and sanitation interventions. The following report is intended to assist the USAID mission in Maputo to achieve the following goals:

- Quantify and prioritize the water/sanitation needs of the populations most affected by the current drought
- Identify the most appropriate strategies and technologies that could be introduced to meet the water and sanitation needs of the affected populations
- Assess the capacity of the government, local engineering firms, and local NGOs to implement the above strategies

## Chapter 2

### NEEDS ASSESSMENT

PRONAR, with substantial assistance from UNICEF, has been working very closely with provincial authorities during the past several months to assess and document the water supply requirements related to the current drought. The Emergency Plan for the drought targets Maputo, Gaza, Inhambane, Sofala, Manica, and Tete provinces as the six provinces facing the most serious problems, i.e., present sources becoming dry or saline (see Appendix D for provincial population figures and Appendix A for a map of the provinces).

The requirements as outlined in the Emergency Plan are categorized and detailed under rural, peri-urban, and urban headings. The total projected budgets of the interventions PRONAR currently is considering are:

Rural	US\$ 7,344,000
Peri-urban	520,000
Urban	828,000
TOTAL	US\$ 8,692,000

As approximately 75 percent of the population normally live in the rural areas of Mozambique, the above apportionment of financial resources is relatively reasonable.

The following text offers an overview of PRONAR's Emergency Plan. (See Appendix C for more details.) It should be mentioned here that as a result of the drought, the lack of food and water has driven large segments of the rural population (primarily from areas south of the Zambeze River) into more populated, urban-like areas in search of food and water.

#### 2.1 Rural

The largest component of the Emergency Plan, the rural sector has been broken into two phases, each with two subphases. The two subphases have been designated "a" and "b." PRONAR and the provinces have categorized the provinces that are currently reasonably safe and/or accessible subphase a, and those that are not secure or easily accessible at this time subphase b.

##### **Phase Ia: US\$ 3,939,000**

- Construction of 675 new sources (245 hand-dug wells, 142 hand-drilled wells, and 288 deep boreholes) equipped with Village Level Operation and Maintenance (VLOM) handpumps

- Rehabilitation of 76 existing sources (56 HDgW and 20 DBh) to be equipped with VLOM handpumps
- Procurement and installation of 650 VLOM handpumps on existing sources
- Internal airlift costs for handpumps and materials

**Phase Ib: US\$ 1,246,000**

- Construction of 251 new sources (82 HDgW, 39 HDrW, and 130 DBh) equipped with VLOM handpumps
- Rehabilitation of 38 existing sources (10 HDgW and 28 DBh) to be equipped with VLOM handpumps

**Phase IIa: US\$ 852,000**

- Procurement of material and equipment for drilling deep boreholes. Four light drilling rigs to be purchased and 60 boreholes drilled.

**Phase IIb: US\$ 1,307,000**

- Procurement of material and equipment for drilling deep boreholes. Six light drilling rigs to be purchased and 90 boreholes drilled.

**RURAL TOTAL: US\$ 7,344,000**

The thrust of the rural phase Ia program focuses on developing new sources (675 new-source developments versus 76 rehabilitation operations), with 43 percent of the new sources in the form of deep boreholes. PRONAR anticipates that rural phase Ia activities can be undertaken within the existing capacity of the Provincial Rural Water Supply Workshops (EPARs) and GEOMOC. The rural phase II component of the Emergency Plan is intended to expand the EPAR/GEOMOC capacity in the provinces via the purchase of 10 light drilling rigs.

## **2.2 Peri-urban**

The proposed interventions are for the most affected peri-urban localities: Chimoio, Xai-Xai, and Chókwe.

**Chimoio: US\$ 79,000**

- Construction of 10 new deep boreholes equipped with VLOM Afridev handpumps and the repair of 10 existing handpumps
- Extension of existing reticulation system and construction of two new standpipes

**Xai-Xai and Chókwe: US\$ 441,000**

- Equipping of currently productive deep boreholes with electric pumps to serve small emergency-piped water supply kits.

**PERI-URBAN TOTAL: US\$ 520,000**

### **2.3 Urban**

The three urban areas of Chimoio, Quelimane, and Beira all have immediate water shortage problems that qualify them for the Emergency Plan. Beira's problem is, however, by far the most serious and will require very close monitoring and timely intervention by the government in order to prevent it from becoming a disaster situation. Quelimane's service population is approaching 300,000 (double the census estimates in Appendix D) because of dislocation due to security and drought, and Beira's is nearing 500,000. Chimoio is in need of immediate geophysical investigation to determine its potential for groundwater development. Proposed interventions for the three areas are as follows:

**Chimoio: US\$ 141,000**

- Construction of 4 new deep boreholes
- Construction of 12 pumphouses
- Procurement and installation of 7 electric pumps
- Installation of small reticulation systems

**Quelimane: US\$ 455,000**

- Construction of 4 deep boreholes
- Construction of 4 pumphouses
- Procurement and installation of 4 electric pumps
- Installation of 2 kilometers of reticulation systems

**Beira: US\$ 232,000**

- Construction of temporary impoundment on Púngoe River to prevent tidal saltwater contamination of Beira's water source

**URBAN TOTAL: US\$ 828,000**

## Chapter 3

# PROPOSED STRATEGIES AND TECHNOLOGY CHOICE ASSESSMENT

The needs assessment developed within the Emergency Plan appears to be based soundly upon considerable field investigations and substantial cooperation with provincial authorities. In addressing the affected rural populations, the separation of secure and nonsecure areas is well advised in the presentation of needs. This distinction should assist in attracting a reasonably quick response for donor assistance.

The Emergency Plan is designed to work within the government's existing institutional framework to deliver the proposed water supply relief interventions. Mozambique's water sector institutional framework is briefly described below (see also Appendix E, "Water Sector Organogram").

### 3.1 Rural Strategy

#### 3.1.1 Water Supply Services

PRONAR is responsible for planning rural water supply interventions and funding disbursement to the provinces. Under the DNA, PRONAR implements projects through the 10 Provincial Directorates for Construction and Water (DPCAs) to deliver water supply services to the intended rural populations. Typically the DPCAs have only four or five civil servants to deal with the water sector. To create actual access to water supplies, DPCAs "contract out" to the Provincial Rural Water Supply Workshops (EPARs) for the construction of hand-dug and hand-drilled wells. The EPARs are staffed by private-sector personnel who bid on work when it is available. If the water supply requirements call for a machine-drilled borehole, the DPCAs request the State Water Drilling Corporation (GEOMOC) to assist. GEOMOC is a state-owned enterprise that may advertise itself as a private firm on occasion. A price negotiation for the undertaking ensues between PRONAR/DPCA and GEOMOC; when an agreement is reached, a formal contract is signed by PRONAR/DPCA and either GEOMOC or the relevant EPAR.

PRONAR has established technical specifications and standards for hand-dug wells, hand-drilled wells, and machine-drilled deep boreholes. Generally, hand-dug wells are used to provide water within 10 meters from the ground surface; hand-drilled wells are constructed to a maximum depth of 20 meters; and machine-drilled boreholes average 40 to 60 meters deep in most parts of the country, although boreholes as deep as 150 meters are required in certain areas.

In order to ensure community involvement with water supply activities, all rural water supply interventions are normally preceded by a formal community participation and education program (PEC) run by the EPARs. A decentralized approach to operation and maintenance

of handpumps has been recently adopted as policy by the Government of Mozambique to allow for more direct involvement by the recipients in the sustained delivery of services. This new policy operates in conjunction with a PRONAR policy decision to begin procurement and installation of VLOM-type handpumps on all new groundwater points developed for village usage. Initially, the chosen VLOM handpump will be the Afridev, and procurement will come from Indian manufacturers. PRONAR will provide village-level maintenance training for water recipients at all new VLOM handpump installation sites.

It is still envisaged that the community participation and education program will be carried out concurrently with the delivery of water supplies to the rural population. However, a delay in delivery of the software component in no way should delay emergency hardware intervention.

Since 1985, UNICEF has been working with PRONAR to provide substantial technical assistance to the rural water supply sector. During that time, production rates for newly developed water sources have dramatically improved, as seen in Appendix F. Delivery of new sources peaked in 1989 with a total of 1,066, and last year 856 new sources were developed. Also as a result of UNICEF technical assistance, a more integrated approach to water supply and sanitation has been developed whereby software issues are woven into the hardware delivery process.

### **3.1.2 Sanitation Services**

Pilot programs are now ongoing in the country to identify the best institutional arrangements under which to deliver rural sanitation services to the population. The rural sanitation subsector is under consideration by PRONAR, the Ministry of Health, and the National Institute for Physical Planning. In July 1992, a national seminar is scheduled to help define the institutional framework within which rural sanitation should fit.

Despite increased outbreaks of cholera during the last two years, the Emergency Plan's needs assessment neglects to mention sanitation interventions. While no one would deny that improved sanitation would certainly help the situation and decrease the risk of cholera and other diseases transmitted by the fecal-oral path, the initiation of a new program in rural sanitation will take time to develop and therefore will fall outside the plan's time frame. For this reason, a sanitation component for the Emergency Plan has been excluded. The rationale for this is that if an improved water supply is developed, the incidence of cholera will decrease automatically because people will not have to depend upon contaminated sources. Also, although improved sanitation may protect existing sources, without an appropriate delivery system, contamination of the water supply is still a disease factor. This by no means, however, advocates the exclusion of a comprehensive rural sanitation program under a normal development planning process for the sector in the future.

Given the above needs assessment and the normal institutional framework within which interventions would be carried out, PRONAR and UNICEF have developed the Emergency Plan financing plan based upon the capabilities of PRONAR/EPAR/GEOMOC. Therefore, while the total needs assessment under rural phase Ia indicates that US\$ 3,939,000 would be

required for the construction of 675 new sources; rehabilitation of 76 sources; and procurement and installation of 650 VLOM handpumps (see Section 2.1), PRONAR has requested only US\$ 2.72 million in donor funding for rural phase I. The requests thus far for funding have been as follows, duly recognizing the amount of work PRONAR can do:

**Swedish/Dutch:** US\$ 720,000

- Construction of 117 new sources (35 HDgW, 13 HDrW, and 69 DBh) with the installation of 117 VLOM handpumps
- Replacement of 4 handpumps on existing wells

**USAID:** US\$ 2,000,000

- Construction of 165 new sources (20 HDgW, 20 HDrW, and 125 DBh) with the installation of 165 VLOM handpumps
- Rehabilitation of 60 existing sources (40 HDgW and 20 DBh) with the installation of 60 VLOM handpumps
- Installation of 650 VLOM handpumps on existing sources

Reviewing the government's normal budget for the water sector for 1992 and considering the above new source requirements under the Emergency Plan, it is possible for PRONAR to implement its normal development program, plus the Emergency Plan, within the next 12 months. PRONAR's borehole construction budget for 1989-92 is as follows:

<b>Year</b>	<b>Meticais Budget</b>	<b>US\$ Equivalent</b>	<b>% 1989</b>
1989	1,200,000,000	2,700,000	100
1990	1,500,000,000	1,500,000	56
1991	1,280,000,000	850,000	32
1992	1,370,000,000	550,000	20

A substantial portion of borehole drilling must be paid for in hard currency (roughly 60 percent of borehole production costs would be for imported components). As a result, the above figures can be shown to have been eroded by 80 percent since 1989 alone. In 1991, PRONAR contracted GEOMOC and the EPARs to have 203 boreholes drilled for rural recipients. While the local currency budget amount was raised slightly in 1992, the US\$ equivalent has declined by 35 percent when compared with 1991 budget figures. PRONAR should be able, therefore, to contract only for approximately 150 boreholes drilled this year under the normal government budgeting. GEOMOC should be able to implement these 150 boreholes plus the 194 boreholes under the Emergency Plan as requested by PRONAR.

GEOMOC's ability to complete 344 boreholes in the next 12 months assumes the corporation takes no outside private sector work, concentrating solely on the drilling of boreholes for PRONAR. To meet this target, it is also imperative that donor funding of the Emergency Plan be finalized by the end of May and that initial cash flows are transferred to PRONAR/GEOMOC within two weeks of that time.

Given that there are 19 percussion and 14 rotary drilling rigs in the six affected provinces (see Appendix G), the goal of drilling 344 boreholes is certainly attainable. It would require each rig to drill, on average, 10.5 wells during the next year. If spare parts are in adequate supply and the planning and management of the rig movements is properly attended to, there is no reason that twice this number could not be drilled with crews working 26 to 28 days per month with overtime.

While the government budget of meticals 1.28 billion was approved for boreholes in 1991, only 5 percent of that amount had been disbursed to PRONAR by June 1991 (the government fiscal year is January 1 through December 31). Only in November 1991 was another 85 percent disbursed, and the remaining 10 percent was withheld altogether. (Government funds that are not used by February 15 of the following year must be returned to the Ministry of Finance.) Donors can therefore play an extremely useful role in bridging this seemingly perpetual funding gap immediately. It is critical to have all drilling rigs in full use as the water supply becomes more scarce.

### **3.2 Urban and Peri-urban Strategy**

To deliver the required interventions to urban and peri-urban areas, the City Water Supply Companies for Chimolo, Quelimane, Beira, Xai-Xai, and Chókwe will, with technical support from the Association of Water Companies (UDAAS), use their own personnel or subcontract the work. This procedure is not well documented in the Emergency Plan but, given the relatively small scale of intervention and the ease of accessibility involved, there would appear to be few impediments to the implementation of the recommendations once financing sources are identified.

*A note of caution should be raised regarding Beira's water supply in particular.* Currently, the City of Beira, the second largest city in Mozambique, is served by a water supply that may soon be deemed unpalatable because of salinity. (Electroconductivity readings are unavailable at this time.) The intake to the system is 50 kilometers upriver from Beira (and the sea) on the Púngoe River. Under normal conditions the Púngoe should have reached peak monthly average flow of approximately 250 cubic meters per second in February. For the month of April the monthly average is normally slightly higher than the mean annual flow of 107 cubic meters per second. This past April, however, the average flow measured on the Púngoe River was less than 5 cubic meters per second, or just 5 percent of its normal flow. Beira's normal water supply requirements are approximately 30,000 cubic meters per day. These requirements will be compounded by the city's growing service population, which by now may have reached 500,000 due to rural-urban movement (Beira's normal population is 350,000).

The strategy PRONAR proposes for a short-term solution to Beira's source problem is satisfactory, calling for the construction of a temporary impoundment downstream of the intake inlet to prevent the saltwater tidal fluctuations from reaching the intake. This structure need not be more than 2 meters in height, as the tidal variation versus the river base elevation at the intake should not exceed that level. This could certainly be constructed using soil-filled bags. Some additional design work needs to be completed before construction could begin, but that should be a fairly simple exercise. The alarming scenario that comes to mind, however, is what would happen if (and most likely when) the Púngoe were to dry up completely before November, when the next rainfall comes. With 350,000 people in Beira now and possibly many migrating to the area during the next few months, the situation could become disastrous. Unfortunately, no proven alternative water source is available at this time. Not only are Beira's 350,000 people at risk, but so will be the whole Beira-corridor food-relief effort if there is no reliable water source for Beira City two months from now.

Because of the potential for the Púngoe to dry up before the next rainfall, a temporary impoundment will not suffice in the long run. Investigations therefore must be carried out *immediately* in order to secure an alternative source for Beira in the event the Púngoe dries up at the present intake site. Geophysical investigations for groundwater potential in the vicinity of the intake/treatment works, as well as investigations upriver from the present intake site, may identify surface waters that can be piped in to the present intake. Nonetheless, other alternatives must be more thoroughly investigated.

### **3.3 Technology Choice**

Referring to Appendix F, the ratio of machine-drilled boreholes to total production for the last three years is at a reasonable level, i.e., roughly 25 percent. Under normal development plans, this ratio allows for 75 percent of the water sources being developed to be established using a less expensive technology, such as hand-dug and hand-drilled wells (see Appendix H). However, during this time of drought, with emergency interventions being planned, the phase Ia rural component of the Emergency Plan calls for 43 percent (288 of 675) of the new sources to be machine-drilled boreholes. This is technically appropriate because the deeper boreholes are much less susceptible to the effects of drought and are less likely to fail should the drought continue past the next expected rainy season.

In the past 10 years, mostly India Mark II handpumps have been installed as the standard pump in Mozambique. They require a centralized maintenance system, which thus far has been mostly unresponsive, resulting in a very high percentage of handpumps lying inoperative, perhaps merely for want of a relatively inexpensive replacement part.

All handpumps to be installed under PRONAR programs in the future *must* be VLOM-type under government mandate. As noted previously, under the Emergency Plan, the handpump of choice is the Afridev, which is imported from India. Together with village-level training, the Afridev will allow recipients to maintain their pumps so as to solve 90 percent of any problems that may arise with them.

## **Chapter 4**

### **INSTITUTIONAL OPTIONS FOR IMPLEMENTATION OF POSSIBLE INTERVENTIONS**

Should the USAID mission decide to fund some portion of the Emergency Plan, several options are available to satisfy the plan's needs. These include the following:

- Direct financing to the National Directorate for Water (DNA) via the Ministry of Finance, with complete government execution
- Financing through a nongovernmental organization such as World Vision, CARE, or Africare that in turn would work through PRONAR and provincial water sector personnel
- Financing through UNICEF to a DNA/PRONAR that is well versed in working through PRONAR and provincial water sector personnel
- Hiring of contract personnel within the USAID mission to oversee any component of execution as listed
- Direct private sector involvement in consulting engineering, construction supervision/inspection, and actual construction/drilling operations
- Additional short-term technical assistance in the water and sanitation sector supporting the USAID mission

#### **4.1 Direct Government Execution**

While direct government execution is ideally the ultimate goal in the process of capacity building within government, given the current constraint of inadequate staff in the water sector, and given the nature of this Emergency Plan, it would be ill-advised to embark upon direct government transfers at this time. To do so would require considerable oversight of the funds and the quality and timeliness of the delivered product. Fund management and quality control would be better enforced via one of the options listed below.

#### **4.2 NGO Management of Funds with PRONAR Execution**

USAID encourages NGO/PRONAR management of funds, as project and relief delivery have often been supported this way in the past. Such is not the case regarding the water supply sector, however. Hence, given the potentially large amount of funding involved in the plan, reasonable care must be taken in employing this model and/or selecting a specific NGO with which to work (see Section 4.3).

The NGOs that have experience in the water sector are World Vision, CARE, Africare, and Save the Children. In discussions with USAID management, it has been agreed that some portion of the water sector relief efforts should be channeled through an NGO to go toward the hiring of a private contractor to supplement the drilling efforts within the Emergency Plan. In talks with the NGOs and in reviews of their proposals for USAID funding in the water sector, CARE appears to show the greatest interest and technical support available in the sector.

Because PRONAR/GEOMOC is expected to drill 344 boreholes in the next 12 months, a rate that may stretch the corporation's production capabilities, it is recommended that an NGO such as CARE be requested to manage the tendering of 50 to 100 boreholes by a private drilling contractor. This arrangement depends entirely upon discussions and agreement with the government. Given the urgent need for water points and the offer to "supplement" the normal governmental process, however, it is not expected to present a problem. The 50 to 100 borehole sites should be selected in a secure zone that is logistically simple to mobilize and work within.

Preliminary discussions with CARE have indicated that the NGO would be willing to enter into such a working arrangement between USAID, a private contractor/driller, and the Mozambique government. CARE's response comes with the proviso that USAID initially present and authorize this general approach of bringing in a regionally based private drilling contractor to assist with the Emergency Plan. Following government approval, CARE would recruit a water sector professional into its operations in Mozambique to oversee the implementation. With CARE's considerable experience worldwide with drilling operations, the organization seems a most appropriate choice to implement this element of the Emergency Plan.

In using an NGO and private-sector drilling contractor, the software elements of the water supply activities will require redesigning in terms of their delivery. As described in chapter 3, predrilling community participation activities normally are programmed with the EPAR(s) conducting the software interventions. Due to the drought, however, drilling operations should not be delayed by community participation and education program (PEC) activities. Nor, however, should the software elements be neglected. Once an NGO (CARE) is given permission by the government to move ahead with the private-sector component of the funding stream, the NGO will have to sit down with PRONAR and agree upon the responsibilities for the entire operation. The more complex area of software will require special attention and eventual agreement before work begins.

A point to be considered is that the contractor, most likely to be a nonresident firm, will not have staff who speak Portuguese. Additionally, it will not be at all appropriate to have the firm involved in activities other than drilling. One solution to allow for PEC activities, then, could be the NGO's further involvement with software delivery, were the government to sanction this approach.

There is no reason to exclude all other NGOs from activities within the water sector USAID supports. USAID is now considering a proposal from Africare to construct 40 wells in Sofala

Province, for example. Efforts such as these should continue to be supported, but of the NGOs mentioned above, only CARE seems capable of adequately managing the large amount of funds involved.

### **4.3 UNICEF Management of Funds with PRONAR Execution**

In the last five years, UNICEF has built up a staff within its Maputo office made up of specialists in water supply and sanitation (WS&S). UNICEF has also provided technical expertise to PRONAR to strengthen government operations within the WS&S sector. UNICEF has by far the best existing capacity within country in the sector through which to channel funding. Last year the UNICEF general resources budget, together with “noted” bilateral funds that were spent in the Mozambique water sector, totaled approximately US\$ 4 million.

If USAID is to consider “buying into” the DNA/PRONAR Emergency Plan, channeling the bulk of the funds through UNICEF seems to be the best institutional arrangement, offering the most in the way of monitoring and reporting. This is not to say that there are not and will not be weaknesses in the institutional arrangement of working through UNICEF/PRONAR. Agreements would have to be reached before final signing off on participation in the water sector Emergency Plan in order to guarantee that UNICEF would monitor USAID funds and scheduling. Reasonable reporting procedures would also need to be agreed upon.

It is recommended that the agreed upon funding participation be divided into at least two disbursements in order to maintain some element of leverage. Under such an arrangement, UNICEF would collect only 5 percent of the total budget as overhead charges, since UNICEF regulations stipulate 5 percent in the category of emergency relief.

### **4.4 Short-term Contract Employment within USAID**

Depending upon the amount of USAID funding committed to the Emergency Plan, it may be advantageous for the mission to contract one person to oversee the disbursement of funds and the quality and timeliness of product delivery. Two potential candidates’ curriculum vitae have been reviewed under this consultancy, and both were found to be qualified for the job.

Although UNICEF should do most of the monitoring and reporting, the organization will be tackling a very heavy workload in response to the drought. Consequently, it is advisable to have a person directly employed by USAID to facilitate UNICEF’s linkages to USAID and further contribute to the Emergency Plan through increased general support to the WS&S sector. If this option is not implemented, some periodic monitoring/inspection work will need to be done throughout the funding cycle via the private sector as described below.

#### **4.5 Private Sector Involvement**

Private-sector involvement in the Emergency Plan could take several forms. In one scenario that outlines an NGO management contract, it has been suggested that supplemental drilling (beyond PRONAR's involvement) be carried out by a private drilling firm. Advertisements placed by the selected NGO would attempt to find drilling contractors in Mozambique, Swaziland, Zimbabwe, and South Africa who are willing and able to mobilize and work in Mozambique. Based upon inquiries in Mozambique thus far, it appears no private drilling firms are available. This information still needs to be confirmed by advertising within Mozambique and neighboring countries, however.

Should USAID become substantially involved in the Emergency Plan funding and choose not to hire someone from its office to help, two private consulting firms, SOMOCON and Profabri, could be of help (see Appendix I). Specifically, the firms could be contracted to provide water supply engineering design and supervision, monitoring, and inspection services. SOMOCON would appear to be the more attractive of the two because 1) the firm is partially locally owned; 2) it has more experience in the water supply sector in Mozambique; and 3) it is associated with a South African firm that could lend the required expertise relatively quickly.

#### **4.6 Short-term Technical Assistance**

The USAID office in Maputo may also require some form of technical monitoring of the Emergency Plan operations during the next 6 to 12 months. These needs are somewhat difficult to pinpoint at this time, but the window of opportunity should be kept open for such help.

As the need arises, the USAID office will develop the scope of work for the inputs and request the A.I.D. Office of Health to identify an appropriate person(s) to provide the required assistance. One form of input from a consultant in the near future that might be useful would be to have someone experienced in disaster assistance "brainstorm" with the Mozambique government, donors, lenders, and NGOs about what to do if the rains do not produce any meaningful precipitation again this year. The city of Bulawayo in Zimbabwe has developed an evacuation plan in case the water supply fails completely. A similar exercise in Mozambique may be appropriate.

## **Chapter 5**

### **PRIORITIZED NEEDS AND RECOMMENDATIONS**

#### **5.1 Recommendations**

Based upon PRONAR's request for USAID to assist in the Emergency Plan of Action--Drought 1992, and based upon information gathered between April 27 and May 8, 1992, the following recommendations are presented:

- PRONAR/EPAR should purchase and install 650 Afridev handpumps on existing sources;
- PRONAR/GEOMOC should drill 50 boreholes and fit them with Afridev pumps as defined in the Emergency Plan;
- Twenty hand-dug wells and 20 hand-drilled wells should be constructed; and
- Sixty existing sources should be rehabilitated and equipped with Afridev handpumps.

The above interventions should be channeled through UNICEF for PRONAR's execution.

Additionally, it is recommended that:

- A private contractor drill 75 boreholes in the Maputo Province (to be undertaken with one of the NGOs [CARE] providing the management for the contract);
- A technically experienced person within the USAID mission be hired to oversee all of the above;
- Funding be provided to Africare as per its recent proposal to construct 40 new water sources; and
- Funds be provided for short-term technical assistance for possibly two separate two-week missions.

Working with the National Directorate for Water (DNA), USAID may want to investigate the alternative water supplies for Beira that are being pursued. As so much of the food relief effort depends on Beira being the port and origin point for shipment within Mozambique and Zimbabwe, a reliable water supply to Beira is critical. Consultants could be used here to help assess the source alternatives.

It is also recommended that US\$ 850,000 for handpumps plus US\$ 300,000 (one-half the remaining UNICEF budget, minus fees) be released immediately to UNICEF if the USAID mission comes to an agreement with the Mozambique government on the methodologies described above. The immediate flow of funds is critical to addressing the emergency-effort time frame. Between now and November, the water supply situation will only get worse unless donors make major efforts to help.

While the government's capacity to implement the plan is not ideal, with UNICEF's technical assistance during the past seven years, the government's abilities have improved. It is recommended then that with proper oversight and monitoring by both UNICEF and USAID, the funds PRONAR/UNICEF has requested should be considered to help alleviate the extreme hardship that seems inevitable in the next six to nine months.

## 5.2 Associated Costs

1) Procurement from India of 915 Afridev handpumps, airfreight costs to Mozambique, and transshipping costs within country. Order of 915 covers 650 replacement pumps; 75 pumps to contractors; 50 GEOMOC boreholes; 40 new hand-dug/drilled wells; 60 borehole rehabilitations; and 40 pumps to Africare for its component in the Emergency Plan.	US\$ 850,000
2) 50 new boreholes to be drilled by GEOMOC @ US\$ 9,000	US\$ 450,000
3) 40 newly constructed shallow wells @ US\$ 1,500	US\$ 60,000
4) 60 existing sources rehabilitated @ US\$ 1,500	US\$ 90,000
5) 75 NGO/contractor new boreholes @ US\$ 15,000	US\$ 1,125,000
6) Mission staff	US\$ 40,000
7) Africare component (including fees)	US\$ 200,000
8) Short-term technical assistance	US\$ 30,000
9) Beira:	
■ consultant	US\$ 20,000
■ remedial construction	US\$ 230,000
10) UNICEF fees:	
5 percent on US\$ 1,450,000	US\$ 75,000

11) CARE fees:  
15 percent on US\$ 1,125,000

US \$170,000

**TOTAL**

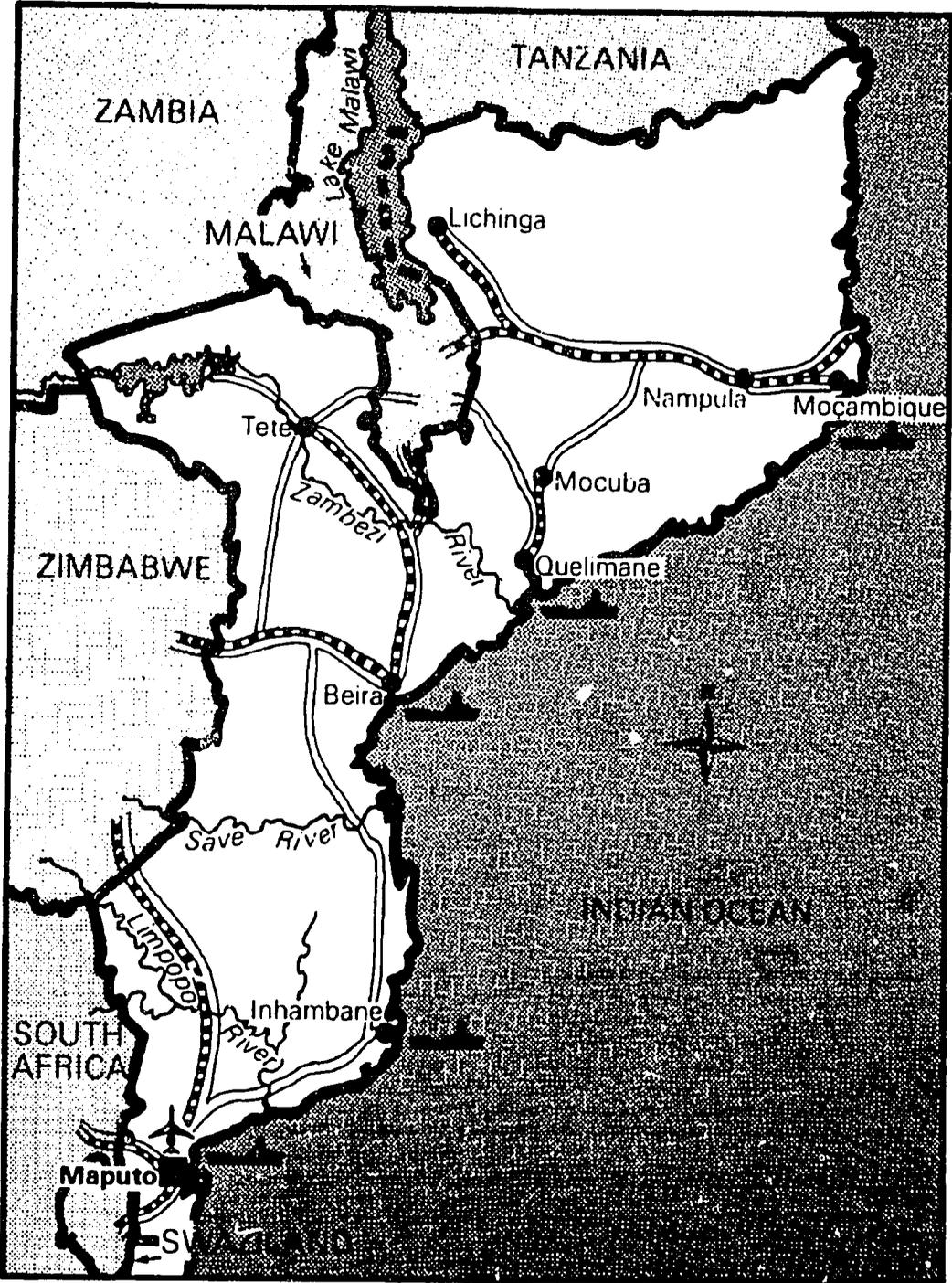
**US\$ 3,340,000**

At this time UNICEF and PRONAR are developing a detailed implementation plan that should be available at the end of May. A separate implementation plan for the CARE/private drilling contractor will be required upon agreement with the Mozambique government. More discussions with Africare are required before funding; Africare would then provide a detailed implementation plan to the USAID office. It must again be emphasized that the implementation plan is completely dependent upon the timing of funds disbursements.

**Appendix A**

**MAPS OF MOZAMBIQUE AND PROVINCES**

**MOZAMBIQUE**

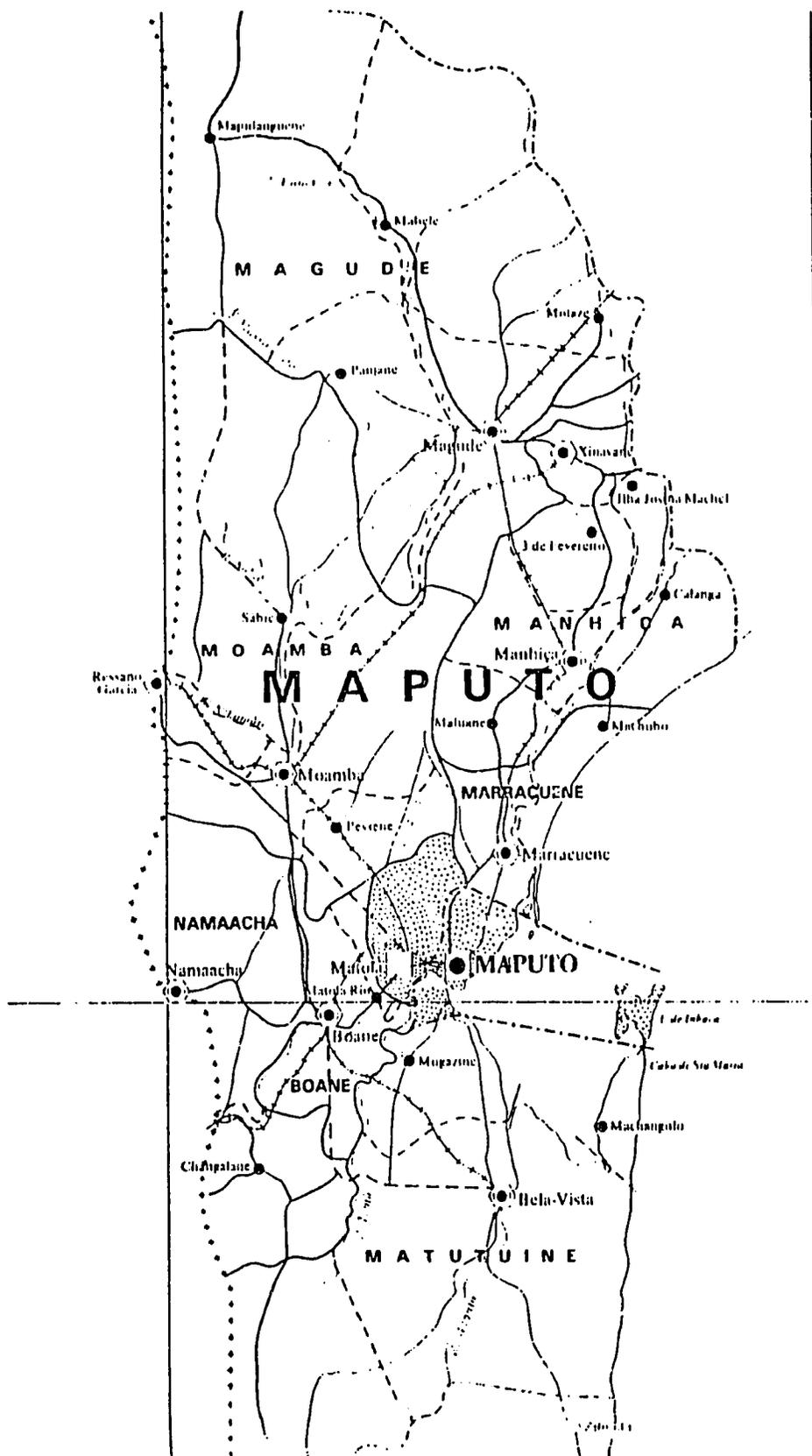




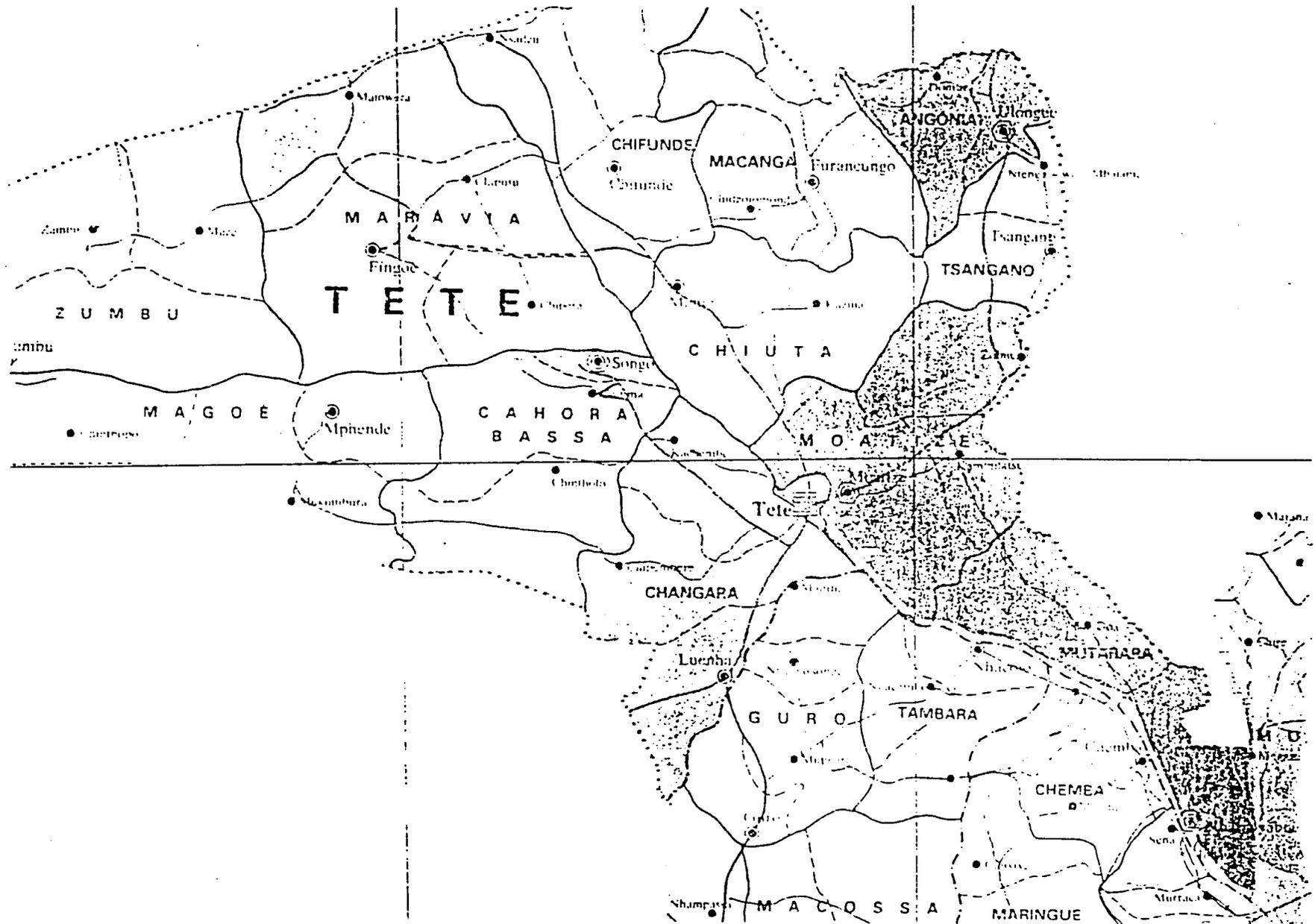




MOZAMBIQUE: MAPUTO PROVINCE



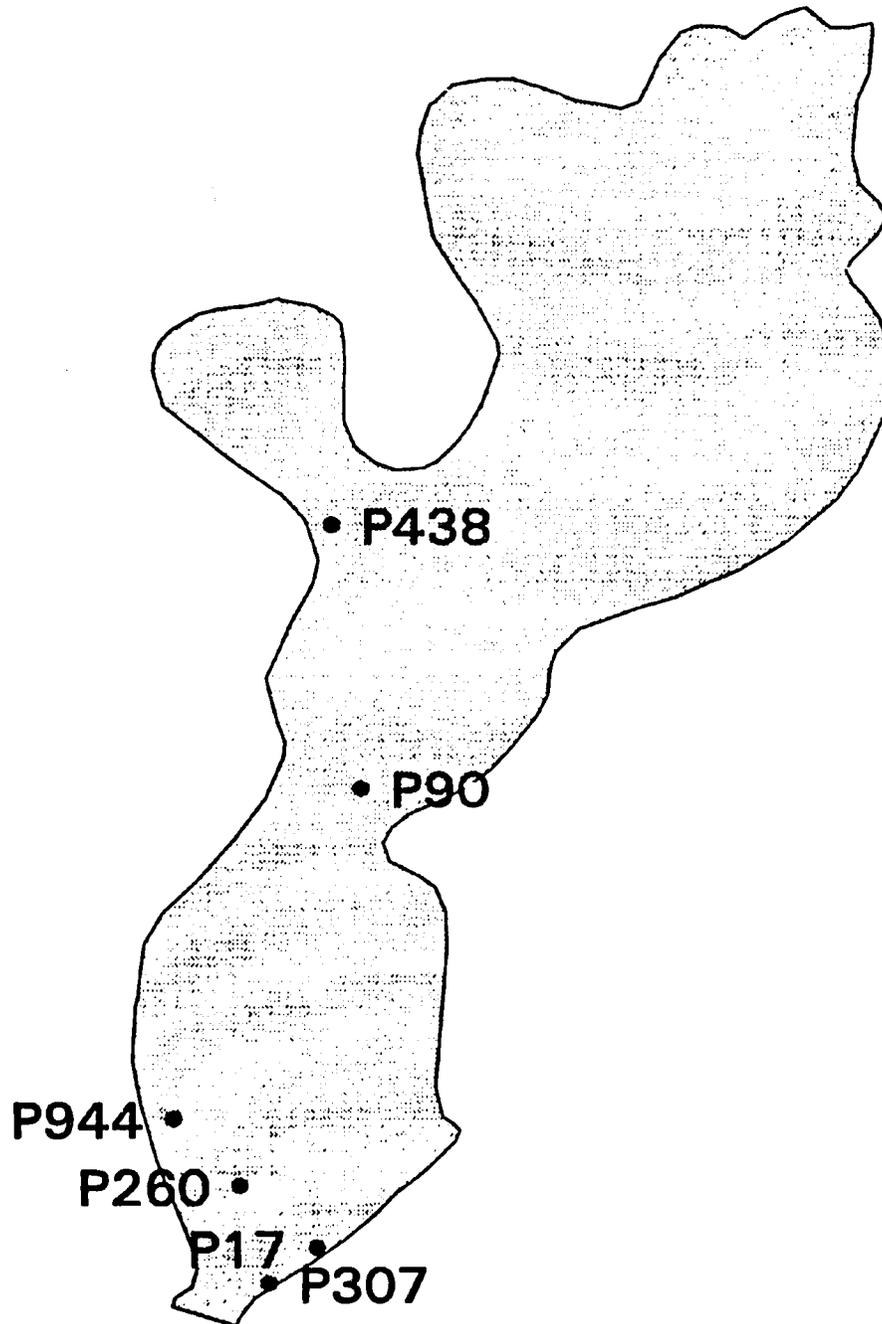
MOZAMBIQUE: TETE PROVINCE



**Appendix B**  
**RAINFALL MAPS AND SUMMARY GRAPHS**

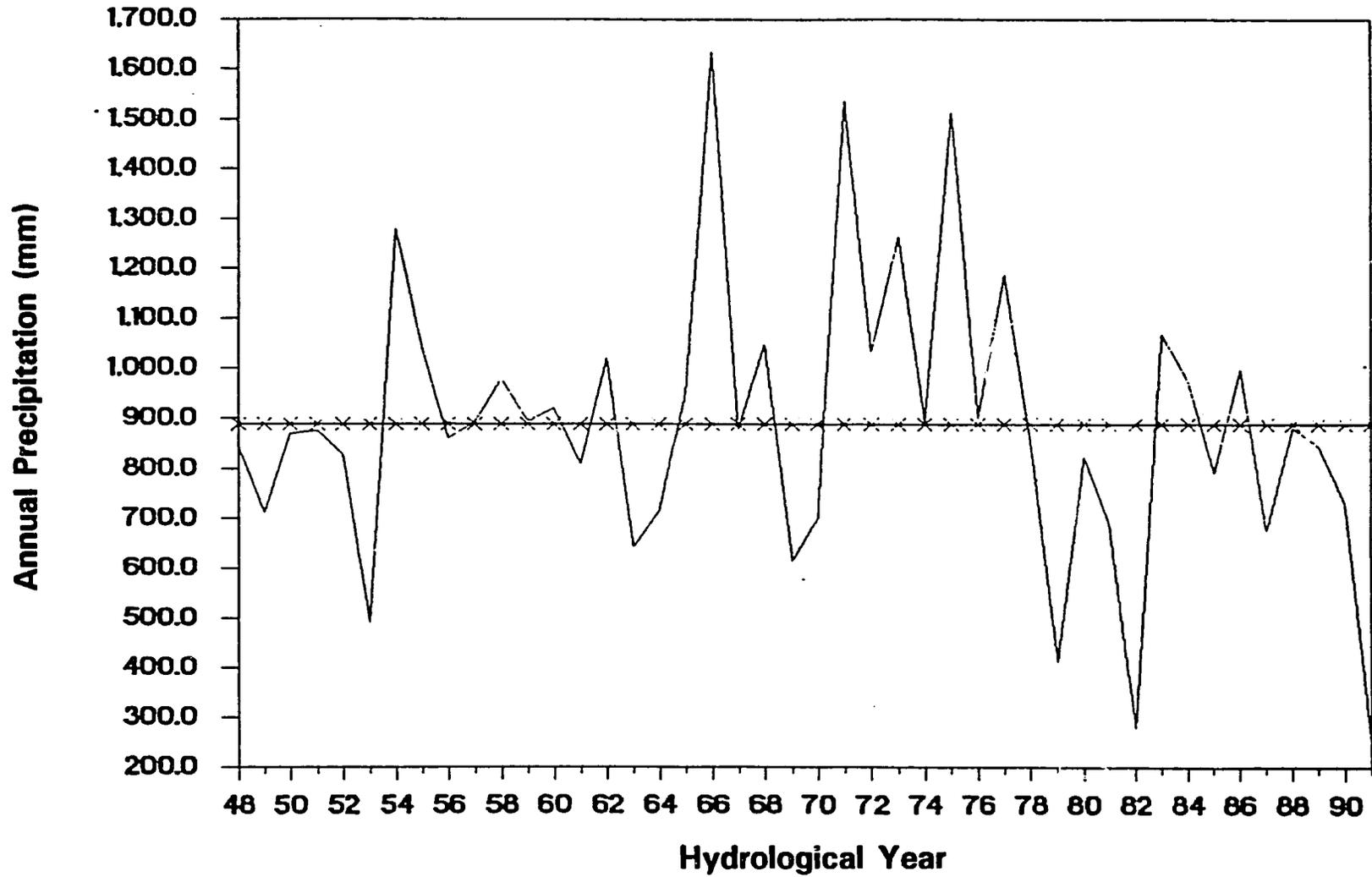


# Location of Annual Precipitation Charts



# RAINFALL STATION P17—CHILAULENE

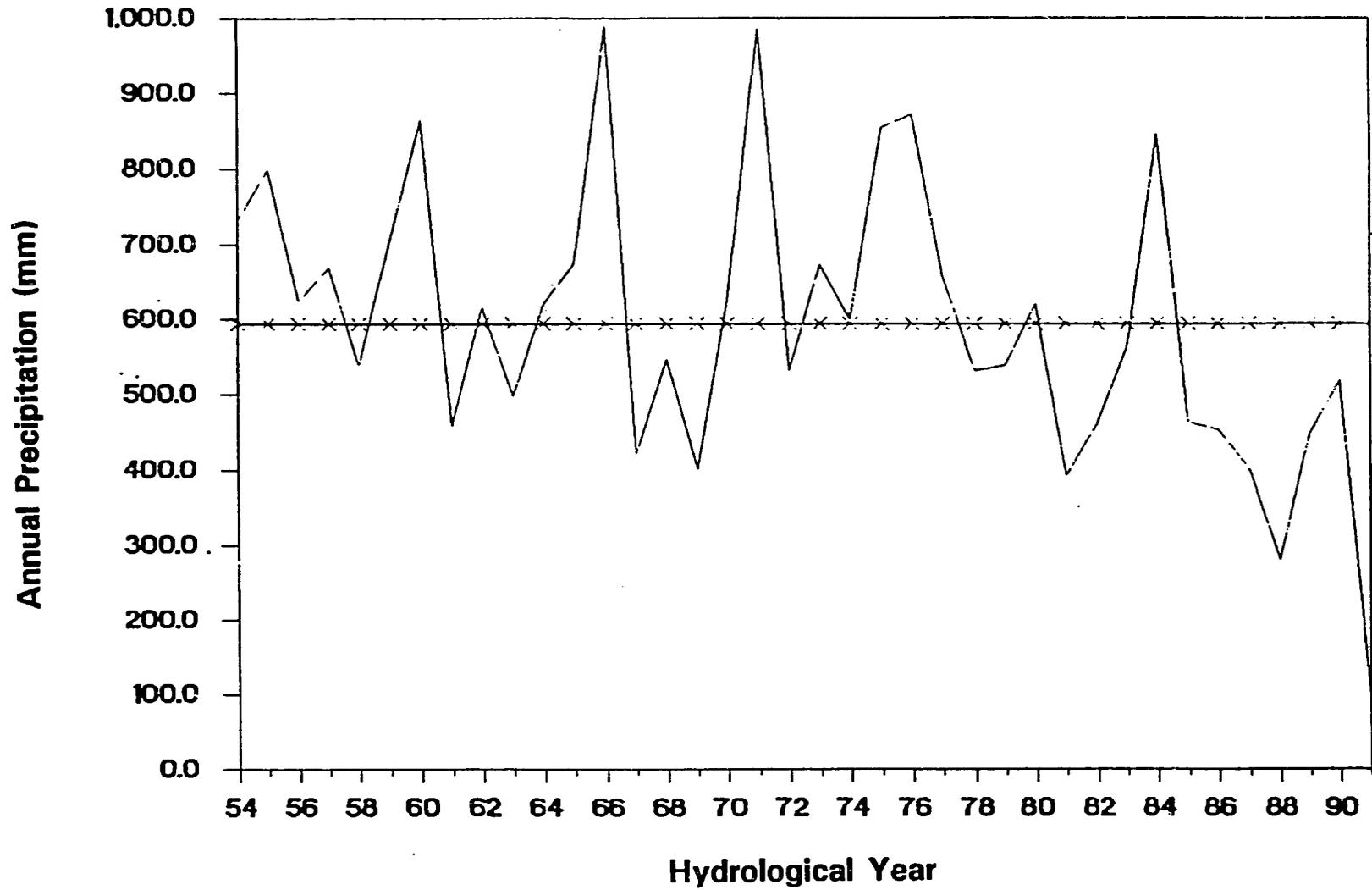
Annual Precipitation 1948/49—1991/92



X Mean Precipitation

# RAINFALL STATION P260—CHOKWE

Annual Precipitation 1954/55—1991/92

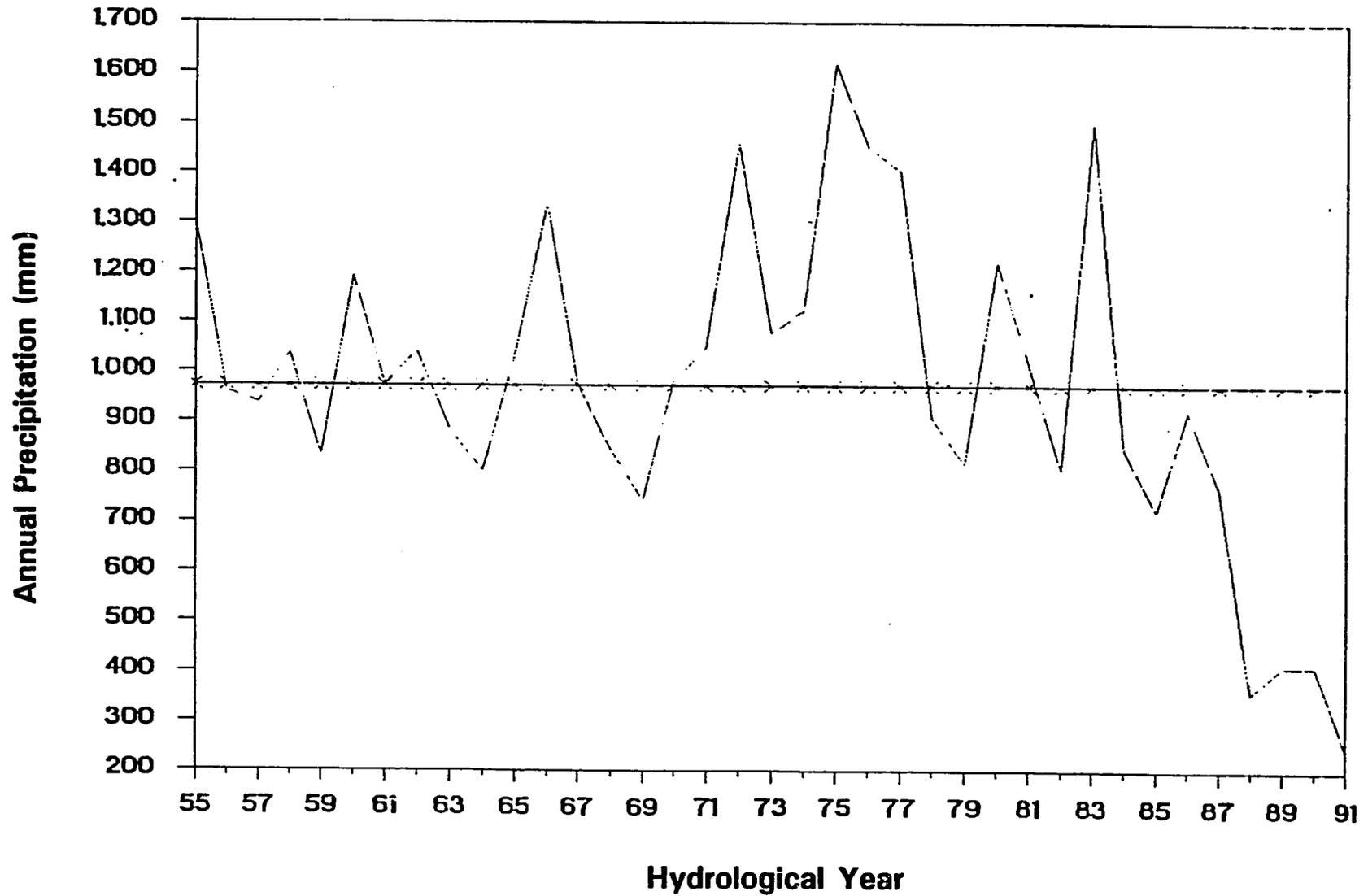


34

X Mean Precipitation

# RAINFALL STATION P307—CALANGA

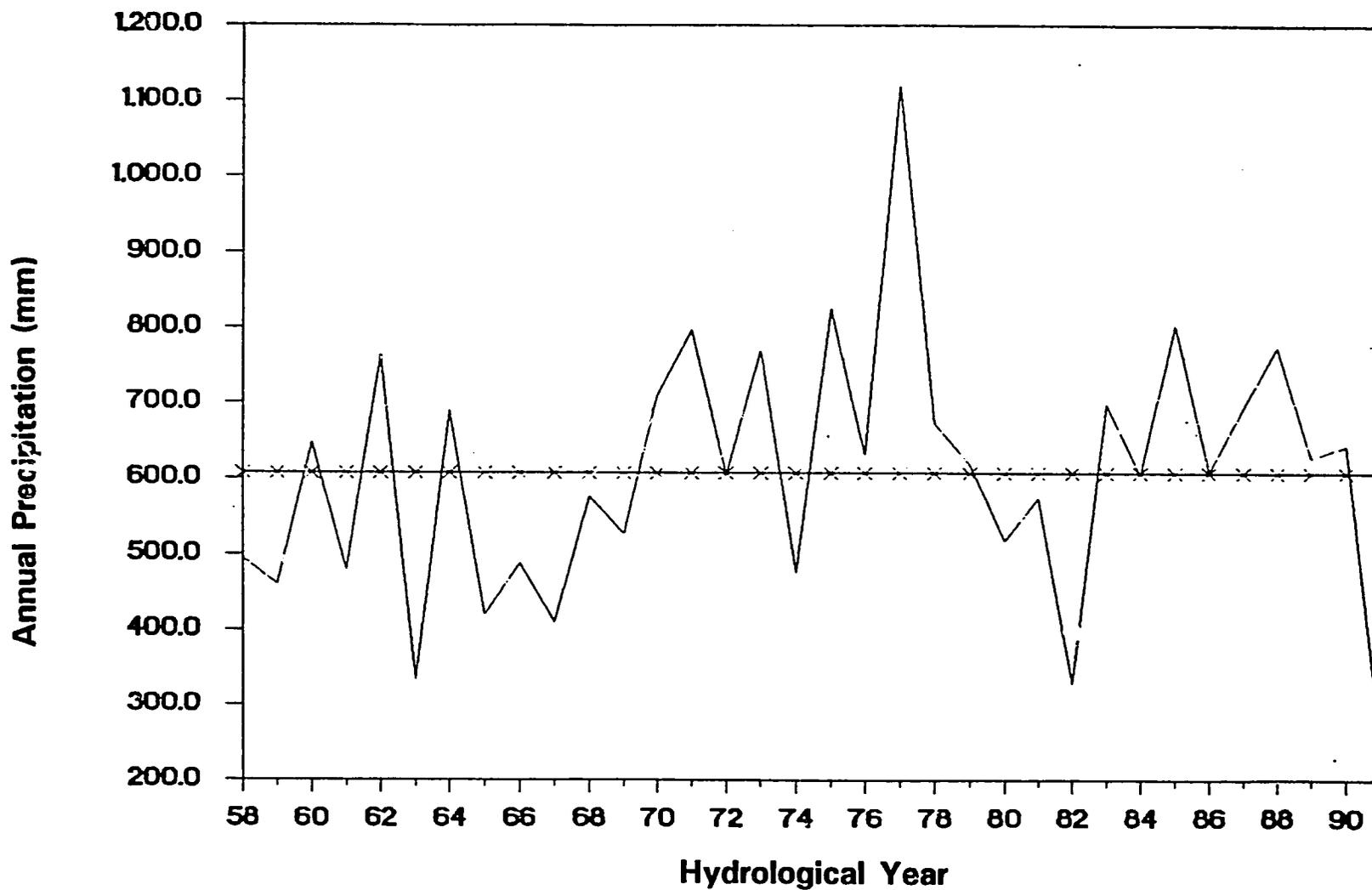
Annual Precipitation 1955/56—1991/92



X Mean Precipitation

# RAINFALL STATION P438—CHINGOZE

Annual Precipitation 1958/59—1991/92

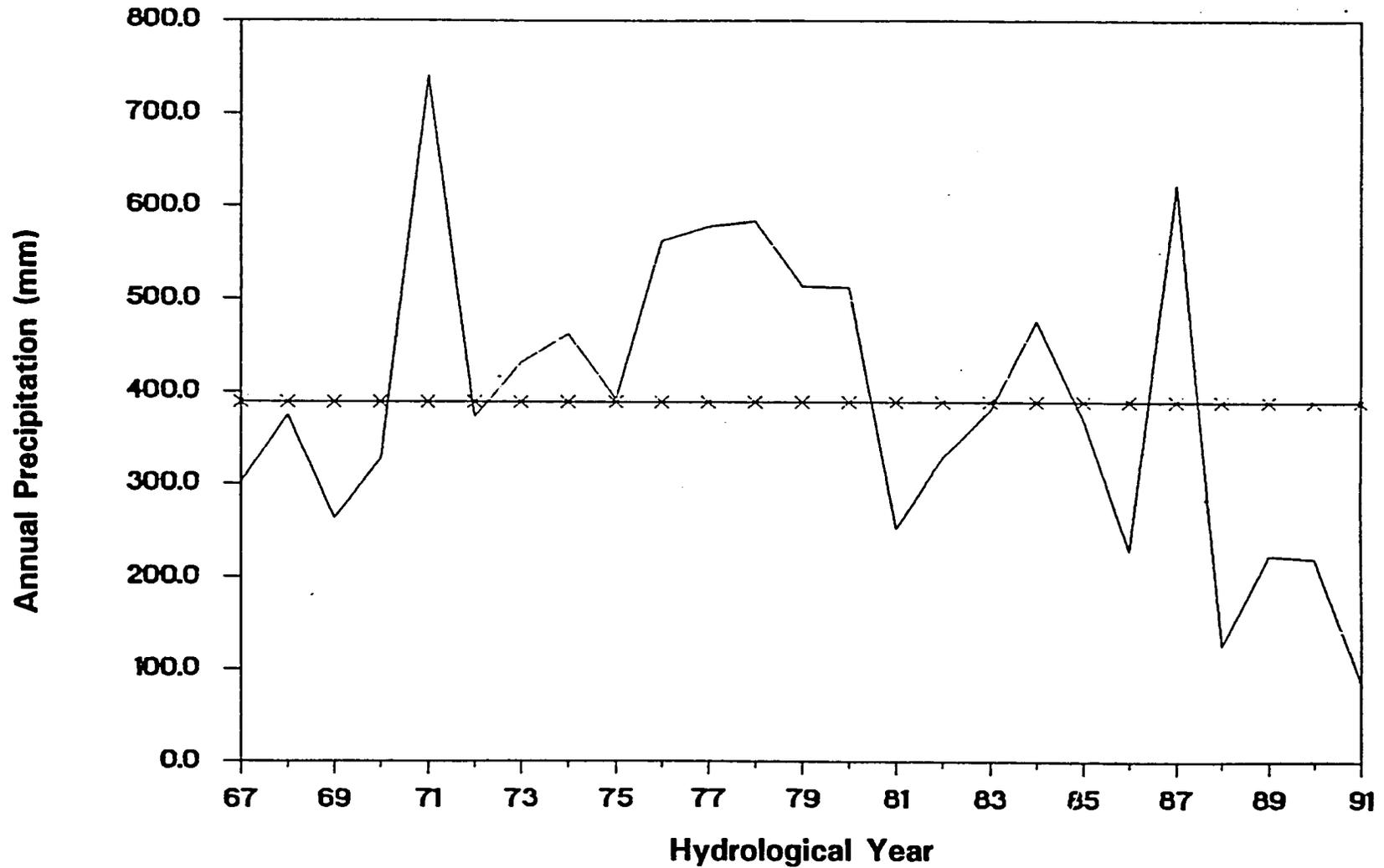


36

X Mean Precipitation

# RAINFALL STATION P944—MASSINGIR

Annual Precipitation 1967/68—1991/92



37

X Mean Precipitation

**Appendix C**

**PRONAR/UNICEF EMERGENCY PLAN OF ACTION—DROUGHT 1992**

TERMS OF REFERENCE  
FOR  
EMERGENCY PLAN OF ACTION - DROUGHT 1992  
  
NATIONAL DIRECTORATE OF WATER (DNA)

1. INTRODUCTION

The 1992 drought in Southern Africa is emerging as the most severe in 50 years. In the south and central parts of Mozambique, the provinces Tete, Manica, Sofala, Zambézia, Inhambane, Gaza and Maputo, most food crops have failed due to lack of rain. In addition the drought has serious drinking-water supply repercussions for the population and livestock.

Due to the lack of rain during the rainy season, the drought will become worse during the dry season, and affect even more areas. Mozambique's surface water resources depend, hydrologically, on the rainfall in the whole southern african region which is also drought effected. The Mozambican groundwater resources depend entirely on the local rainfall.

Even with a normal amount of rainfall during the dry season (May-November) the shortage of water will increase as ground water tables are dropping and many rivers are allready dry. As the drought effects the whole region, border crossing rivers have a low flow, as many big dams in the region are not discharging water.

As river flows are very low, sea water intrudes in the river deltas and effects areas normally without salt problems. Major urban water supply systems in the coastal areas extract water from the river, from boreholes close to the riverbeds or from boreholes in the coastal sanddunes. The water quality is deteriorating because of the low river flows; getting gradually more saline. In the city of Beira the water system is allready suppling salt-polluted water.

The rural polulation depend principally on groundwater sources as surface water sources have dried up. Compounding the situation is the fact that many handpumps are in bad condition and often break down.

The visible impact of a drought situation starts with a reduction of the agricultural production and with difficulties regarding the drinking-water supply. Given a futher deterioration of the food and water supply combined with the financial weakness of the Mozambican water sector, dramatic situations will occur. The absence of drinking-water endangers human survival and implicates that large groups

of the rural population will migrate to areas less effected by the drought.

The National Directorate of Water formulated the following emergency plan of action to diminish the shortage of drinking water in the rural, peri-urban and urban areas.

## 2. EMERGENCY COORDINATION GROUP

Within the National Directorate of Water a coordination group has been created to deal with drought related emergency actions. This group will execute drought related studies, coordinate plans of action and supervise the implementation of drought related emergency projects. The coordination group is created mainly to promote dynamic interventions to satisfy immediate water supply needs, in the most urgent areas.

The experience obtained during this exercise will benefit the sector's ability to prepare future emergency plans of action in similar situations.

The emergency coordination group is presided by the National Director of Water and consists of the following members:

Nelson Beet, José A. Ronda, Arlindo Correia, Cascilda André e Bernardo Novela.

These technicians represent the Rural, Peri-urban and Urban water supply sectors.

## 3. OBJECTIVES

The main objective of this emergency plan of action is to undertake actions to diminish the most urgent water supply needs and additionally to act anticipating the water supply situation at the end of the dry season.

## 4. ACTUAL WATER SUPPLY SITUATION

As already mentioned in the introduction, the actual water supply situation in the urban, peri-urban and rural areas, is alarming. The intrusion of salt water, the dropping ground water tables, dry rivers and low water levels in the dams urge quick interventions.

On this basis the National Directorate of Water elaborated this emergency plan of action.

## 6. SECTOR STRATEGY

The strategy for each sub-sector is to implement as quick as possible the following emergency interventions:

#### RURAL SUBSECTOR:

##### a) Phase I

The financing of the construction of new water sources in selected districts in the provinces of Tete, Sofala, Manica, Inhambane, Gaza and Maputo, using the existing executive capacity. During Phase I major emphasis will be given to the construction of deep boreholes.

The financing of the repair and deepening of existing sources in the same districts.

The procurement, transport and instalation of "VLOM" handpumps, on the new sources and to substitute obsolete pumps on existing sources.

##### b) Phase II

While Phase I is designed to use the existing construction capacity in the above mentioned provinces, Phase II is designed to increase the construction capacity through an investment in deep borehole drilling equipment and material.

The investment will be used to procure drilling kits to train staff, and to pay for the construction costs.

Phase II includes as well the procurement of quick intervention kits for small piped water systems in district centres and refugee accomodation camps.

#### PERI-URBAN SECTOR

The strategy of the periurban sector is to diminish the user group of the urban water systems, through the construction and repair of main system independent water sources.

To repair and install handpumps on water sources in the peri-urban areas.

To involve NGO's and a part of EPAR's construction capacity to construct new and deepen existing wells and boreholes in the peri-urban areas involving the community.

The equip productive deep boreholes with pumps to serve small emergency piped water supply kits.

#### URBAN SECTOR

To finance and construct works, like dams, to permit the storage and supply of water from alternative sources and to establish a protection against salt water intrusion.

To finance the construction of deep boreholes and the installation of electro pumps to reinforce the production capacity of safe drinkwater through the main systems.

To carry out emergency works nearby the raw water intakes to guarantee regular and rational water supply to the cities.

To execute these interventions contracts will be signed with contractors like GEOMOC, EPAR's, HIDROMOC, the Water Companies and/or private enterprises having the construction capacity.

## 6. DONOR PARTICIPATION

The water sector considers donor participation in the emergency plan of action to diminish drought effects very important. Donor coordination is important to obtain maximum efficiency in executing the proposed activities.

In this context the Water sector proposes the division of the main interventions per donor. The proposed rough division is as follows:

1. Through UNICEF
  - a) The procurement, importation and installation of handpumps, and the construction and repair of sources.
  - b) The transport by air or by road of handpumps to the provinces.
  - c) The airlift of handpumps to districts inaccessible by road due to the security situation.
  - d) The increase in execution capacity of EPAR's.
2. UNDP
  - a) To finance and help the coordination, supervision and control of implementation through support of the coordination group within the National Directorate of Water,
  - b) To finance and help studies regarding the drought, through support of the coordination group within the National Directorate of Water,
  - c) Procurement of office material, financing of travel for the coordination group within the National Directorate of Water.
3. NGO's
  - a) Assistance in the field of construction and repair activities of water sources, especially the small piped water systems.
  - b) To procure basic construction material,

c) Assistance in local currency financment of activities.

## 7. PLAN OF INTERVENTIONS

In annex, the plans of action of the rural, peri-urban and urban sub sectors.

### Phase Ia, rural

Allready parcially funded,

With funds from the Dutch and Swedish governments through UNICEF (U7), for completion till end of June 1992:

136 new water sources equiped with handpumps and the instalation of 4 handpumps on existing sources.

Under negociation with USAID through UNICEF (U8), for completion till September 1992:

165 new sources with new handpumps  
60 repair of existing sources with new handpumps  
650 new handpumps to substitute existing obsolete handpumps on existing sources.

The air and road transport to provinces and landlocked districts.

Unfunded part of Phase Ia, the existing construction capacity probably not enough to finalize construction totally before the end of September 1992:

374 new sources with new handpumps  
16 repair of existing sources with new handpumps  
The air and road transport to provinces and landlocked districts.

### Phase Ib, rural

Presently untunded:

289 new sources constructed with locally procured handpumps, due to difficult access to these districts it will not be easy to construct these sources during 1992.

289 new handpumps (airlifted) installed to substitute existing obsolete handpumps on existing sources.

The air and road transport to provinces and landlocked districts.

### Phase II, rural

Not funded yet, but presented, through UNICEF, to ODA:

The procurement of drilling kits to increase construction capacity. A typical kit consists of a jumper percussion rig, a small towable water tank, protection material, casing pipe, construction costs, a light vehicle, 15 handpumps and training funds.

The procurement of quick intervention kits for small piped water

systems in district centres and refugee accomodation camps.

Annexes A and B relate to the phases I and II of the rural plan of action.

Peri-Urban and Urban sector

The annexes C-F relate to the plans of intervention for the peri-urban and urban sectors, for the cities of Chimoio, Quelimane, Xai-Xai/Chokwe and Beira.

Maputo, April 1992.

**NATIONAL DIRECTORATE OF WATER (DNA)**

**EMERGENCY PLAN OF ACTION**

			Funded US\$ * 1000	Unfunded US\$ * 1000
<b>RURAL</b>	<b>PHASE Ia</b>	Construction of 751 new sources equipped with handpumps Annex A	720	2.281
		Procurement and installation of 650 extra hand-pumps Annex A	0	616
		Internal airlift costs for handpumps, materials and administration and management costs Annex A	0	322
	<b>PHASE Ib</b>	Construction of 289 new sources Annex A	0	899 *)
		Procurement and installation of 289 handpumps Annex A	0	347
	<b>PHASE IIa</b>	Procurement of material and equipment for drilling of deep boreholes Annex B	0	852
	<b>PHASE IIb</b>	Procurement of material and equipment for drilling of deep boreholes Annex B	0	1.307
<b>PERI URBAN</b>	Peri-urban water supply, Chimoio; the construction of 10 new deep boreholes with handpumps and two standposts, Annex C	0	79	
	Peri-urban water supply to cities of Xai-Xai and Chokwe Annex E	0	441	
<b>URBAN</b>	Urban water supply to city of CHIMOIO Annex C	0	141	
	Urban water supply to city of QUELIMANE Annex D	0	455	
	Urban water supply to city of BEIRA Annex F	0	232	
<b>TOTAL FUNDED</b>			720	
<b>TOTAL UNFUNDED</b>				7.971

\*) Construction only possible early 1993

ANNEX A,  
DNA PRONAR  
Plan of action, Phase I

NATIONAL RURAL WATER SUPPLY PROGRAMME

SUMMARY		TOTAL		VALUE US\$		U7 Swedish Dutch MW 521-02 PHASE Ia	U8 USAID FASE Ia	UNFUNDED FASE Ia
		PHASE Ia	PHASE Ib	PHASE Ia	PHASE Ib			
CONSTRUCTION	Plan	245	82	\$367,500	\$123,000			
NEW SHALLOW- WELLS	Financing - U7	42	0	\$63,000	\$0	\$63,000		
	Financing - U8	20	0	\$30,000	\$0		\$30,000	
	Unfunded	183	82	\$274,500	\$123,000			\$274,500
RECUOPERATION	Plan	56	10	\$42,000	\$7,500			
EXISTING SHALLOW- WELLS	Financing - U7	0	0	\$0	\$0	\$0		
	Financing - U8	40	0	\$30,000	\$0		\$30,000	
	Unfunded	16	10	\$12,000	\$7,500			\$12,000
CONSTRUCTION	Plan	142	39	\$177,500	\$48,750			
NEW HAND- DRILLED BOREHOLES	Financing - U7	15	0	\$18,750	\$0	\$18,750		
	Financing - U8	20	0	\$25,000	\$0		\$25,000	
	Unfunded	107	39	\$133,750	\$48,750			\$133,750
CONSTRUCTION	Plan	288	130	\$1,440,000	\$650,000			
NEW DEEP BOREHOLES	Financing - U7	79	0	\$395,000	\$0	\$395,000		
	Financing - U8	125	0	\$625,000	\$0		\$625,000	
	Unfunded	84	130	\$420,000	\$650,000			\$420,000
RECUOPERATION	Plan	20	28	\$50,000	\$70,000			
EXISTING DEEP BOREHOLES	Financing - U7	0	0	\$0	\$0	\$0		
	Financing - U8	20	0	\$50,000	\$0		\$50,000	
	Unfunded	0	28	\$0	\$70,000			\$0
HANDPUMP INSTALLATION	Plan	1401	289	\$560,400	\$115,600			
	Financing - U7	140	0	\$56,000	\$0	\$56,000		
	Financing - U8	875	0	\$350,000	\$0		\$350,000	
	Unfunded	386	289	\$154,400	\$115,600			\$154,400
PURCHASE	Plan	301	92	\$114,260	\$34,923			
AFRIDEV 9 m SETTING (NEW WELLS)	Financing - U7	42	0	\$15,943	\$0	\$15,943		
	Financing - U8	60	0	\$22,776	\$0		\$22,776	
	Unfunded	199	92	\$75,540	\$34,923			\$75,540
PURCHASE	Plan	142	39	\$62,764	\$17,238			
AFRIDEV 15 m SETTING (NEW WELLS)	Financing - U7	15	0	\$6,630	\$0	\$6,630		
	Financing - U8	20	0	\$8,840	\$0		\$8,840	
	Unfunded	107	39	\$47,294	\$17,238			\$47,294
PURCHASE	Plan	260	143	\$165,620	\$91,091			
AFRIDEV 30 m SETTING (NEW WELLS)	Financing - U7	57	0	\$36,309	\$0	\$36,309		
	Financing - U8	128	0	\$81,536	\$0		\$81,536	
	Unfunded	75	143	\$47,775	\$91,091			\$47,775
PURCHASE	Plan	48	15	\$280,800	\$87,750			
VOLANTA 80 m SETTING (NEW WELLS)	Financing - U7	22	0	\$128,700	\$0	\$128,700		
	Financing - U8	17	0	\$99,450	\$0		\$99,450	
	Unfunded	9	15	\$52,650	\$87,750			\$52,650
PURCHASE	Plan	300	0	\$132,600	\$0			
AFRIDEV 15 m SETTING (EXISTING WELLS)	Financing - U7	0	0	\$0	\$0	\$0		
	Financing - U8	300	0	\$132,600	\$0		\$132,600	
	Unfunded	0	0	\$0	\$0			\$0
PURCHASE	Plan	350	0	\$222,950	\$0			
AFRIDEV 30 m SETTING (EXISTING WELLS)	Financing - U7	0	0	\$0	\$0	\$0		
	Financing - U8	350	0	\$222,950	\$0		\$222,950	
	Unfunded	0	0	\$0	\$0			\$0
<b>TOTALS</b>						\$720,332	\$1,678,152	\$1,217,909

NATIONAL RURAL WATER SUPPLY PROGRAMME

PROPOSAL 13/04/1992

PROVINCE		MAPUTO								TOTAL 1a	TOTAL 1b
		C H A N G A L A N E	M O A M B A	M A R R A Q U E N H E	N A M A C H A	B O A N E	M A N H I C A	M A G U D E	M A T A T U I N E		
TYPE OF INTERVENTION	DISTRICT										
CONSTRUCTION NEW SHALLOW- WELLS	Plan	10	0	5	0	0	10	10	10	25	20
	Financing - U7	3	0	3	0	0	0	0	0	6	0
	Financing - U8	0	0	0	0	0	0	0	0	2	0
	Unfunded	7	0	2	0	0	8	10	10	17	20
RECUPERATION EXISTING SHALLOW- WELLS	Plan	2	0	1	0	0	1	0	0	4	0
	Financing - U7	0	0	0	0	0	0	0	0	0	0
	Financing - U8	2	0	1	0	0	1	0	0	4	0
	Unfunded	0	0	0	0	0	0	0	0	0	0
CONSTRUCTION NEW HAND- DRILLED BOREHOLES	Plan	0	0	0	0	0	0	0	0	0	0
	Financing - U7	0	0	0	0	0	0	0	0	0	0
	Financing - U8	0	0	0	0	0	0	0	0	0	0
	Unfunded	0	0	0	0	0	0	0	0	0	0
CONSTRUCTION NEW DEEP BOREHOLES	Plan	8	8	5	10	5	5	8	5	41	13
	Financing - U7	3	3	0	1	1	2	0	0	10	0
	Financing - U8	3	3	3	2	2	1	0	0	14	0
	Unfunded	2	2	2	7	2	2	8	5	17	13
RECUPERATION EXISTING DEEP BOREHOLES	Plan	1	0	0	2	0	0	0	0	3	0
	Financing - U7	0	0	0	0	0	0	0	0	0	0
	Financing - U8	1	0	0	2	0	0	0	0	3	0
	Unfunded	0	0	0	0	0	0	0	0	0	0
HANDPUMP INSTALLATION	Plan	34	21	24	25	18	27	18	15	149	33
	Financing - U7	6	3	3	1	1	2	0	0	16	0
	Financing - U8	19	16	17	17	15	15	0	0	99	0
	Unfunded	9	2	4	7	2	10	18	15	34	33
PURCHASE AFRIDEV 9 m SETTING (NEW WELLS)	Plan	12	0	6	0	0	11	10	10	29	20
	Financing - U7	3	0	3	0	0	0	0	0	6	0
	Financing - U8	2	0	1	0	0	3	0	0	6	0
	Unfunded	7	0	2	0	0	8	10	10	17	20
PURCHASE AFRIDEV 15 m SETTING (NEW WELLS)	Plan	0	0	0	0	0	0	0	0	0	0
	Financing - U7	0	0	0	0	0	0	0	0	0	0
	Financing - U8	0	0	0	0	0	0	0	0	0	0
	Unfunded	0	0	0	0	0	0	0	0	0	0
PURCHASE AFRIDEV 30 m SETTING (NEW WELLS)	Plan	9	8	5	12	5	5	8	5	44	13
	Financing - U7	3	3	0	1	1	2	0	0	10	0
	Financing - U8	4	3	3	4	2	1	0	0	17	0
	Unfunded	2	2	2	7	2	2	8	5	17	13
PURCHASE VOLANTA 80 m SETTING (NEW WELLS)	Plan	0	0	0	0	0	0	0	0	0	0
	Financing - U7	0	0	0	0	0	0	0	0	0	0
	Financing - U8	0	0	0	0	0	0	0	0	0	0
	Unfunded	0	0	0	0	0	0	0	0	0	0
PURCHASE AFRIDEV 15 m SETTING (EXISTING WELLS)	Plan	6	6	6	6	6	5	0	0	35	0
	Financing - U7	0	0	0	0	0	0	0	0	0	0
	Financing - U8	6	6	6	6	6	5	0	0	35	0
	Unfunded	0	0	0	0	0	0	0	0	0	0
PURCHASE AFRIDEV 30 m SETTING (EXISTING WELLS)	Plan	7	7	7	7	7	6	0	0	41	0
	Financing - U7	0	0	0	0	0	0	0	0	0	0
	Financing - U8	7	7	7	7	7	6	0	0	41	0
	Unfunded	0	0	0	0	0	0	0	0	0	0

NATIONAL RURAL WATER SUPPLY PROGRAMME

PROPOSAL 13/04/1992

		GAZA												
		PROVINCE												
		PHASE Ia												
		PHASE Ib												
DISTRICT		CHICUALLAC	MABALANE	MASSINGIR	CHIBUTO	CHOKWE	XAI-XAI	BILENE-MAC	MANDLAKAZE	MASSANGENA	CHIGUBO	GUIJA	TOTAL Ia	TOTAL Ib
TYPE OF INTERVENTION														
CONSTRUCTION	Plan	0	0	0	2	0	4	2	6	0	0	5	14	5
NEW SHALLOW-WELLS	Financing - U7	0	0	0	1	0	1	1	1	0	0	0	4	0
	Financing - U8	0	0	0	1	0	1	1	1	0	0	0	4	0
	Unfunded	0	0	0	0	0	2	0	4	0	0	5	6	5
RECUPERATION	Plan	0	0	0	2	0	2	2	2	0	0	0	8	0
EXISTING SHALLOW-WELLS	Financing - U7	0	0	0	0	0	0	0	0	0	0	0	0	0
	Financing - U8	0	0	0	2	0	2	2	2	0	0	0	8	0
	Unfunded	0	0	0	0	0	0	0	0	0	0	0	0	0
CONSTRUCTION	Plan	0	0	0	6	0	2	6	9	5	0	5	23	10
NEW HAND-DRILLED BOREHOLES	Financing - U7	0	0	0	2	0	2	2	4	0	0	0	10	0
	Financing - U8	0	0	0	2	0	0	2	4	0	0	0	8	0
	Unfunded	0	0	0	2	0	0	2	1	5	0	5	5	10
CONSTRUCTION	Plan	0	0	0	8	9	8	8	8	10	10	8	41	28
NEW DEEP BOREHOLES	Financing - U7	0	0	0	3	3	3	3	3	0	0	0	15	0
	Financing - U8	0	0	0	5	6	5	5	5	0	0	0	26	0
	Unfunded	0	0	0	0	0	0	0	0	10	10	8	0	28
RECUPERATION	Plan	2	1	1	0	0	0	0	0	0	0	0	4	0
EXISTING DEEP BOREHOLES	Financing - U7	0	0	0	0	0	0	0	0	0	0	0	0	0
	Financing - U8	2	1	1	0	0	0	0	0	0	0	0	4	0
	Unfunded	0	0	0	0	0	0	0	0	0	0	0	0	0
HANDPUMP INSTALLATION	Plan	21	18	18	39	25	37	38	39	15	10	18	227	43
	Financing - U7	2	1	1	6	3	6	6	8	0	0	0	29	0
	Financing - U8	17	16	16	31	22	29	30	26	0	0	0	187	0
	Unfunded	2	1	1	2	0	2	2	5	15	10	18	11	43
PURCHASE AFRIDEV 9 m SETTING (NEW WELLS)	Plan	0	0	0	4	0	6	4	8	0	0	5	22	5
	Financing - U7	0	0	0	1	0	1	1	1	0	0	0	4	0
	Financing - U8	0	0	0	3	0	3	3	3	0	0	0	12	0
	Unfunded	0	0	0	0	0	2	0	4	0	0	5	6	5
PURCHASE AFRIDEV 15 m SETTING (NEW WELLS)	Plan	0	0	0	6	0	2	6	9	5	0	5	23	10
	Financing - U7	0	0	0	2	0	2	2	4	0	0	0	10	0
	Financing - U8	0	0	0	2	0	0	2	4	0	0	0	8	0
	Unfunded	0	0	0	2	0	0	2	1	5	0	5	5	10
PURCHASE AFRIDEV 30 m SETTING (NEW WELLS)	Plan	2	1	1	8	4	6	6	6	10	10	8	26	28
	Financing - U7	0	0	0	3	0	2	2	2	0	0	0	5	0
	Financing - U8	0	0	0	5	4	4	4	4	0	0	0	21	0
	Unfunded	2	1	1	0	0	0	0	0	10	10	8	0	28
PURCHASE VOLANTA 80 m SETTING (NEW WELLS)	Plan	4	2	2	0	5	2	2	2	0	0	0	19	0
	Financing - U7	2	1	1	0	3	1	1	1	0	0	0	10	0
	Financing - U8	2	1	1	0	2	1	1	1	0	0	0	9	0
	Unfunded	0	0	0	0	0	0	0	0	0	0	0	0	0
PURCHASE AFRIDEV 15 m SETTING (EXISTING WELLS)	Plan	5	5	5	11	6	11	10	10	0	0	0	63	0
	Financing - U7	0	0	0	0	0	0	0	0	0	0	0	0	0
	Financing - U8	5	5	5	11	6	11	10	10	0	0	0	63	0
	Unfunded	0	0	0	0	0	0	0	0	0	0	0	0	0
PURCHASE AFRIDEV 30 m SETTING (EXISTING WELLS)	Plan	10	10	10	10	10	10	10	4	0	0	0	74	0
	Financing - U7	0	0	0	0	0	0	0	0	0	0	0	0	0
	Financing - U8	10	10	10	10	10	10	10	4	0	0	0	74	0
	Unfunded	0	0	0	0	0	0	0	0	0	0	0	0	0

NATIONAL RURAL WATER SUPPLY PROGRAMME

PROPOSAL 13/04/1992

PROVINCE		INIAMBANE														TOTAL la	TOTAL lb
PHASE 1a																	
PHASE 1b																	
TYPE OF INTERVENTION	DISTRICT	FUNHLOURO	MABOTHE	INIASSORO	VILAKULO	MASSINGA	GUURO	MORRUMBENE	HOMONHE	ZAVALLA	INHARRIMBE	JANGAMO	MAXIXE	INIAMBANE	PANDA	TOTAL la	TOTAL lb
		CONSTRUCTION	Plan	0	0	8	8	5	10	10	5	5	5	5	10	10	5
NEW SHALLOW-WELLS	Financing - U7	0	0	1	1	1	1	1	1	1	1	1	1	1	0	11	0
	Financing - U8	0	0	1	1	1	1	0	0	0	0	0	0	0	0	4	0
	Unfunded	0	0	6	6	3	8	9	4	4	4	4	9	9	5	66	5
RECUPERATION	Plan	0	0	1	1	1	1	1	1	1	0	0	0	0	0	8	0
EXISTING SHALLOW-WELLS	Financing - U7	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Financing - U8	0	0	1	1	1	1	1	1	1	0	0	0	0	0	8	0
	Unfunded	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
CONSTRUCTION	Plan	0	0	10	10	5	10	10	5	5	5	5	5	5	5	75	5
NEW HAND-DRILLED BOREHOLES	Financing - U7	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Financing - U8	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Unfunded	0	0	10	10	5	10	10	5	5	5	5	5	5	5	75	5
CONSTRUCTION	Plan	10	6	6	10	10	10	4	4	4	4	0	5	0	10	73	10
NEW DEEP BOREHOLES	Financing - U7	5	2	2	1	2	2	0	0	1	1	0	1	0	0	17	0
	Financing - U8	3	2	2	4	3	3	2	2	2	1	0	1	0	0	25	0
	Unfunded	2	2	2	5	5	5	2	2	1	2	0	3	0	10	31	10
RECUPERATION	Plan	0	0	0	1	0	0	0	0	2	0	0	1	0	0	4	0
EXISTING DEEP BOREHOLES	Financing - U7	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Financing - U8	0	0	0	1	0	0	0	0	2	0	0	1	0	0	4	0
	Unfunded	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
HANDPUMP INSTALLATION	Plan	21	17	37	42	32	42	36	25	26	24	19	30	23	20	374	20
AFRIDEV 9 m SETTING (NEW WELLS)	Financing - U7	5	2	3	2	3	3	1	1	2	2	1	2	1	0	28	0
	Financing - U8	14	13	16	19	16	16	14	13	14	11	9	11	8	0	174	0
	Unfunded	2	2	18	21	13	23	21	11	10	11	9	17	14	20	172	20
PURCHASE AFRIDEV 9 m SETTING (NEW WELLS)	Plan	0	0	9	9	6	11	11	6	6	6	5	10	10	5	89	5
AFRIDEV 15 m SETTING (NEW WELLS)	Financing - U7	0	0	1	1	1	1	1	1	1	1	1	1	1	0	11	0
	Financing - U8	0	0	2	2	2	2	1	1	1	1	0	0	0	0	12	0
	Unfunded	0	0	6	6	3	8	9	4	4	4	4	9	9	5	66	5
PURCHASE AFRIDEV 15 m SETTING (EXISTING WELLS)	Plan	0	0	10	10	5	10	10	5	5	5	5	5	5	5	75	5
AFRIDEV 30 m SETTING (NEW WELLS)	Financing - U7	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Financing - U8	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Unfunded	0	0	10	10	5	10	10	5	5	5	5	5	5	5	75	5
PURCHASE AFRIDEV 30 m SETTING (EXISTING WELLS)	Plan	7	3	6	11	5	7	4	4	2	0	0	4	0	10	53	10
AFRIDEV 80 m SETTING (NEW WELLS)	Financing - U7	2	0	2	1	2	2	0	0	0	0	0	0	0	0	9	0
	Financing - U8	3	1	2	5	2	1	2	2	2	0	0	1	0	0	21	0
	Unfunded	2	2	2	5	1	4	2	2	0	0	0	3	0	10	23	10
PURCHASE AFRIDEV 15 m SETTING (EXISTING WELLS)	Plan	3	3	0	0	5	3	0	0	4	4	0	2	0	0	24	0
AFRIDEV 30 m SETTING (EXISTING WELLS)	Financing - U7	3	2	0	0	0	0	0	0	1	1	0	1	0	0	8	0
	Financing - U8	0	1	0	0	1	2	0	0	2	1	0	1	0	0	8	0
	Unfunded	0	0	0	0	4	1	0	0	1	2	0	0	0	0	8	0
PURCHASE AFRIDEV 15 m SETTING (EXISTING WELLS)	Plan	5	5	6	6	5	5	5	5	4	4	4	4	3	0	61	0
AFRIDEV 30 m SETTING (EXISTING WELLS)	Financing - U7	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Financing - U8	5	5	6	6	5	5	5	5	4	4	4	4	3	0	61	0
	Unfunded	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
PURCHASE AFRIDEV 30 m SETTING (EXISTING WELLS)	Plan	6	6	6	6	6	6	6	5	5	5	5	5	5	0	72	0
AFRIDEV 30 m SETTING (EXISTING WELLS)	Financing - U7	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Financing - U8	6	6	6	6	6	6	6	5	5	5	5	5	5	0	72	0
	Unfunded	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

NATIONAL RURAL WATER SUPPLY PROGRAMME

PROPOSAL 13/04/1992

		SOFALA														
PROVINCE																
PHASE Ia																
PHASE Ib																
DISTRICT		NHAMA	DONDO	BEIRA	CAIA	MACHANGA	HUZI	GORONGOZA	CHIBABUVA	MARRROMBU	MUANZA	CHERINGOMA	MARRINGUE	CHEMBA	TOTAL Ia	TOTAL Ib
TYPE OF INTERVENTION																
CONSTRUCTION NEW SHALLOW - WELLS	Plan	6	4	8	0	0	0	6	0	6	6	0	0	0	24	13
	Financing - U7	3	2	2	0	0	0	0	0	0	0	0	0	0	7	0
	Financing - U8	0	0	1	0	0	0	2	0	0	0	0	0	0	3	0
	Unfunded	3	2	5	0	0	0	4	0	6	6	0	0	0	14	12
RECUPERATION EXISTING SHALLOW - WELLS	Plan	0	0	16	4	0	0	3	0	6	4	0	0	0	23	10
	Financing - U7	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Financing - U8	0	0	5	1	0	0	1	0	0	0	0	0	0	7	0
	Unfunded	0	0	11	3	0	0	2	0	6	4	0	0	0	16	10
CONSTRUCTION NEW HAND - DRILLED BOREHOLES	Plan	4	8	0	0	10	10	8	0	8	6	0	4	6	40	24
	Financing - U7	0	0	0	0	5	0	0	0	0	0	0	0	0	5	0
	Financing - U8	0	3	0	0	0	5	0	0	0	0	0	0	0	8	0
	Unfunded	4	5	0	0	5	5	8	0	8	6	0	4	6	27	24
CONSTRUCTION NEW DEEP BOREHOLES	Plan	8	12	5	0	0	0	0	0	0	0	0	0	0	13	0
	Financing - U7	7	6	0	0	0	0	0	0	0	0	0	0	0	22	0
	Financing - U8	1	6	5	0	0	0	10	0	0	0	0	0	0	0	51
	Unfunded	0	0	0	0	0	0	0	15	0	6	10	10	10	0	51
RECUPERATION EXISTING DEEP BOREHOLES	Plan	0	0	0	0	0	0	0	0	0	0	3	3	2	0	13
	Financing - U7	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Financing - U8	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Unfunded	0	0	0	0	0	0	0	5	0	0	3	3	2	0	13
HANDPUMP INSTALLATION	Plan	35	41	46	21	27	27	44	20	20	22	13	17	18	241	110
	Financing - U7	10	8	2	0	5	0	0	0	0	0	0	0	0	25	0
	Financing - U8	18	26	28	18	17	22	30	0	0	0	0	0	0	159	0
	Unfunded	7	7	16	3	5	5	14	20	20	22	13	17	18	57	110
PURCHASE AFRIDEV 9 m SETTING (NEW WELLS)	Plan	6	4	24	4	0	0	9	0	12	10	0	0	0	7	0
	Financing - U7	3	2	2	0	0	0	0	0	0	0	0	0	0	10	0
	Financing - U8	0	0	6	1	0	0	3	0	0	0	0	0	0	30	22
	Unfunded	3	2	16	3	0	0	6	0	12	10	0	0	0	40	24
PURCHASE AFRIDEV 15 m SETTING (NEW WELLS)	Plan	4	8	0	0	10	10	8	0	8	6	0	4	6	40	24
	Financing - U7	0	0	0	0	5	0	0	0	0	0	0	0	0	5	0
	Financing - U8	0	3	0	0	0	5	0	0	0	0	0	0	0	8	0
	Unfunded	4	5	0	0	5	5	8	0	8	6	0	4	6	27	24
PURCHASE AFRIDEV 30 m SETTING (NEW WELLS)	Plan	8	12	5	0	0	0	10	0	6	13	8	12	35	49	
	Financing - U7	7	6	0	0	0	0	0	0	0	0	0	0	0	13	0
	Financing - U8	1	6	5	0	0	0	10	0	0	0	0	0	0	22	0
	Unfunded	0	0	0	0	0	0	0	10	0	6	13	8	12	0	49
PURCHASE VOLANTA 80 m SETTING (NEW WELLS)	Plan	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Financing - U7	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Financing - U8	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Unfunded	0	0	0	0	0	0	0	10	0	0	0	5	0	0	15
PURCHASE AFRIDEV 15 m SETTING (EXISTING WELLS)	Plan	8	8	8	8	8	8	7	0	0	0	0	0	0	55	0
	Financing - U7	0	0	0	0	0	0	0	0	0	0	0	0	0	55	0
	Financing - U8	8	8	8	8	8	8	7	0	0	0	0	0	0	0	0
	Unfunded	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
PURCHASE AFRIDEV 30 m SETTING (EXISTING WELLS)	Plan	9	9	9	9	9	9	10	0	0	0	0	0	0	64	0
	Financing - U7	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Financing - U8	9	9	9	9	9	9	10	0	0	0	0	0	0	64	0
	Unfunded	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

NATIONAL RURAL WATER SUPPLY PROGRAMME

PROPOSAL 13/04/1992

PROVINCE		MANICA										TOTAL 1a	TOTAL 1b
		S U S S E N D E N G	M A N I C A	G O N D O L A	B A R U E	M A C H A Z E	M O S S U R I Z E	T A M B A R A	G U R O	M A C C O S S A			
PHASE 1a													
PHASE 1b													
DISTRICT													
TYPE OF INTERVENTION													
CONSTRUCTION NEW SHALLOW - WELLS	Plan	0	0	6	10	0	5	10	0	0	0	21	10
	Financing - U7	0	0	4	3	0	0	0	0	0	0	7	0
	Financing - U8	0	0	1	0	0	0	0	0	0	0	1	0
	Unfunded	0	0	1	7	0	5	10	0	0	0	13	10
RECUPERATION EXISTING SHALLOW - WELLS	Plan	3	0	0	0	0	0	0	0	0	3	0	
	Financing - U7	0	0	0	0	0	0	0	0	0	0	0	0
	Financing - U8	3	0	0	0	0	0	0	0	0	3	0	
	Unfunded	0	0	0	0	0	0	0	0	0	0	0	0
CONSTRUCTION NEW HAND- DRILLED BOREHOLES	Plan	0	0	0	0	0	0	0	0	0	0	0	0
	Financing - U7	0	0	0	0	0	0	0	0	0	0	0	0
	Financing - U8	0	0	0	0	0	0	0	0	0	0	0	0
	Unfunded	0	0	0	0	0	0	0	0	0	0	0	0
CONSTRUCTION NEW DEEP BOREHOLES	Plan	5	17	15	0	0	0	0	0	10	0	37	10
	Financing - U7	2	2	2	0	0	0	0	0	0	0	6	0
	Financing - U8	2	5	4	0	0	0	0	0	0	0	11	0
	Unfunded	1	10	9	0	0	0	0	0	10	0	20	10
RECUPERATION EXISTING DEEP BOREHOLES	Plan	2	0	0	0	0	0	5	5	5	2	15	
	Financing - U7	0	0	0	0	0	0	0	0	0	0	0	0
	Financing - U8	2	0	0	0	0	0	0	0	0	2	0	
	Unfunded	0	0	0	0	0	0	5	5	5	0	15	
HANDPUMP INSTALLATION	Plan	19	26	31	21	16	16	15	15	5	124	35	
	Financing - U7	2	2	6	3	4	0	0	0	0	17	0	
	Financing - U8	16	14	15	11	11	11	0	0	0	78	0	
	Unfunded	1	10	10	7	1	5	15	15	5	29	35	
PURCHASE AFRIDEV 9 m SETTING (NEW WELLS)	Plan	3	0	6	10	0	5	10	0	0	24	10	
	Financing - U7	0	0	4	3	0	0	0	0	0	7	0	
	Financing - U8	7	0	1	0	0	0	0	0	0	4	0	
	Unfunded	0	0	1	7	0	5	10	0	0	13	10	
PURCHASE AFRIDEV 15 m SETTING (NEW WELLS)	Plan	0	0	0	0	0	0	0	0	0	0	0	0
	Financing - U7	0	0	0	0	0	0	0	0	0	0	0	0
	Financing - U8	0	0	0	0	0	0	0	0	0	0	0	0
	Unfunded	0	0	0	0	0	0	0	0	0	0	0	0
PURCHASE AFRIDEV 30 m SETTING (NEW WELLS)	Plan	7	17	15	0	0	0	5	15	5	34	25	
	Financing - U7	2	2	2	0	0	0	0	0	0	2	0	
	Financing - U8	4	5	4	0	0	0	0	0	0	13	0	
	Unfunded	1	10	9	0	0	0	5	15	5	19	25	
PURCHASE VOLANTA 80 m SETTING (NEW WELLS)	Plan	0	0	0	0	5	0	0	0	0	5	0	
	Financing - U7	0	0	0	0	4	0	0	0	0	4	0	
	Financing - U8	0	0	0	0	0	0	0	0	0	0	0	
	Unfunded	0	0	0	0	1	0	0	0	0	1	0	
PURCHASE AFRIDEV 15 m SETTING (EXISTING WELLS)	Plan	4	4	5	5	5	5	0	0	0	28	0	
	Financing - U7	0	0	0	0	0	0	0	0	0	0	0	0
	Financing - U8	4	4	5	5	5	5	0	0	0	28	0	
	Unfunded	0	0	0	0	0	0	0	0	0	0	0	0
PURCHASE AFRIDEV 30 m SETTING (EXISTING WELLS)	Plan	5	5	5	6	6	6	0	0	0	33	0	
	Financing - U7	0	0	0	0	0	0	0	0	0	0	0	0
	Financing - U8	5	5	5	6	6	6	0	0	0	33	0	
	Unfunded	0	0	0	0	0	0	0	0	0	0	0	0

NATIONAL RURAL WATER SUPPLY PROGRAMME

PROPOSAL 13/04/1992

PROVINCE		TETE														TOTAL 1a	TOTAL 1b								
		DISTRICT																							
		CHANGARRA	TETE	MOATIZZE	MAGOE	CAHORA BAS	TSANGANO	ANGONIA	MARAVIA	CHIFUNDE	CHUITA	ZUMBO	MUTARRARA	MACANGA											
TYPE OF INTERVENTION	Plan	Financing - U7	Financing - U8	Unfunded	Plan	Financing - U7	Financing - U8	Unfunded	Plan	Financing - U7	Financing - U8	Unfunded	Plan	Financing - U7	Financing - U8	Unfunded	Plan	Financing - U7	Financing - U8	Unfunded	Plan	Financing - U7	Financing - U8	Unfunded	
CONSTRUCTION	Plan	4	6	6	8	7	10	10	10	10	6	10	10	10	10	10	77	30							
NEW SHALLOW- WELLS	Financing - U7	0	2	2	2	0	0	0	0	1	0	0	0	0	0	0	7	0							
	Financing - U8	0	1	1	1	0	0	0	0	0	0	0	0	0	0	0	3	0							
	Unfunded	4	3	3	5	7	10	10	10	9	10	6	10	10	10	10	67	30							
RECUPERATION	Plan	0	3	2	2	0	0	0	0	0	0	0	0	0	0	0	0	0							
EXISTING SHALLOW- WELLS	Financing - U7	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0							
	Financing - U8	0	3	2	2	0	0	0	0	0	0	0	0	0	0	0	7	0							
	Unfunded	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0							
CONSTRUCTION	Plan	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0							
NEW HAND- DRILLED BOREHOLES	Financing - U7	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0							
	Financing - U8	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0							
	Unfunded	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0							
CONSTRUCTION	Plan	7	7	7	5	8	2	2	6	6	6	6	6	6	6	6	56	18							
NEW DEEP BOREHOLES	Financing - U7	5	1	3	3	4	0	0	0	0	2	0	0	0	0	0	18	0							
	Financing - U8	2	4	3	2	3	0	0	4	4	0	0	0	0	0	0	22	0							
	Unfunded	0	2	1	0	1	2	2	2	2	4	6	6	6	6	6	16	18							
RECUPERATION	Plan	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0							
EXISTING DEEP BOREHOLES	Financing - U7	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0							
	Financing - U8	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0							
	Unfunded	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0							
HANDPUMP INSTALLATION	Plan	26	31	30	30	30	12	12	31	31	26	16	16	16	16	259	48								
	Financing - U7	5	3	5	5	4	0	0	1	0	2	0	0	0	0	25	0								
	Financing - U8	17	23	21	20	18	0	0	19	19	14	0	0	0	0	151	0								
	Unfunded	4	5	4	5	8	12	12	11	12	10	16	16	16	16	83	48								
PURCHASE	Plan	4	9	8	10	7	10	10	10	10	6	10	10	10	10	84	30								
AFRIDEV 9 m SETTING (NEW WELLS)	Financing - U7	0	2	2	2	0	0	0	1	0	0	0	0	0	0	7	0								
	Financing - U8	0	4	3	3	0	0	0	0	0	0	0	0	0	0	10	0								
	Unfunded	4	3	3	5	7	10	10	9	10	6	10	10	10	10	67	30								
PURCHASE	Plan	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0							
AFRIDEV 15 m SETTING (NEW WELLS)	Financing - U7	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0							
	Financing - U8	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0							
	Unfunded	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0							
PURCHASE	Plan	7	7	7	5	8	2	2	6	6	6	6	6	6	6	56	18								
AFRIDEV 30 m SETTING (NEW WELLS)	Financing - U7	5	1	3	3	4	0	0	0	0	2	0	0	0	0	18	0								
	Financing - U8	2	4	3	2	3	0	0	4	4	0	0	0	0	0	22	0								
	Unfunded	0	2	1	0	1	2	2	2	2	4	6	6	6	6	16	18								
PURCHASE	Plan	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0							
VOLANTA 80 m SETTING (NEW WELLS)	Financing - U7	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0							
	Financing - U8	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0							
	Unfunded	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0							
PURCHASE	Plan	7	7	7	7	7	0	0	7	7	6	0	0	0	0	55	0								
AFRIDEV 15 m SETTING (EXISTING WELLS)	Financing - U7	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0							
	Financing - U8	7	7	7	7	7	0	0	7	7	6	0	0	0	0	55	0								
	Unfunded	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0							
PURCHASE	Plan	8	8	8	8	8	0	0	8	8	8	0	0	0	0	64	0								
AFRIDEV 30 m SETTING (EXISTING WELLS)	Financing - U7	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0							
	Financing - U8	8	8	8	8	8	0	0	8	8	8	0	0	0	0	64	0								
	Unfunded	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0							

PROPOSAL 13/04/1992

		CONTINGENCY	
		C O N T I N G E N T	T O T A L
PROVINCE			
PHASE Ia			
PHASE Ib			
DISTRICT			
TYPE OF INTERVENTION			la
CONSTRUCTION NEW SHALLOW- WELLS	Plan	3	3
	Financing - U7	0	0
	Financing - U8	3	3
	Unfunded	0	0
RECUPERATION EXISTING SHALLOW- WELLS	Plan	3	3
	Financing - U7	0	0
	Financing - U8	3	3
	Unfunded	0	0
CONSTRUCTION NEW HAND- DRILLED BOREHOLES	Plan	4	4
	Financing - U7	0	0
	Financing - U8	4	4
	Unfunded	0	0
CONSTRUCTION NEW DEEP BOREHOLES	Plan	5	5
	Financing - U7	0	0
	Financing - U8	5	5
	Unfunded	0	0
RECUPERATION EXISTING DEEP BOREHOLES	Plan	7	7
	Financing - U7	0	0
	Financing - U8	7	7
	Unfunded	0	0
HANDPUMP INSTALLATION	Plan	27	27
	Financing - U7	0	0
	Financing - U8	27	27
	Unfunded	0	0
PURCHASE AFRIDEV 9 m SETTING (NEW WELLS)	Plan	6	6
	Financing - U7	0	0
	Financing - U8	6	6
	Unfunded	0	0
PURCHASE AFRIDEV 15 m SETTING (NEW WELLS)	Plan	4	4
	Financing - U7	0	0
	Financing - U8	4	4
	Unfunded	0	0
PURCHASE AFRIDEV 30 m SETTING (NEW WELLS)	Plan	12	12
	Financing - U7	0	0
	Financing - U8	12	12
	Unfunded	0	0
PURCHASE VOLANTA 80 m SETTING (NEW WELLS)	Plan	0	0
	Financing - U7	0	0
	Financing - U8	0	0
	Unfunded	0	0
PURCHASE AFRIDEV 15 m SETTING (EXISTING WELLS)	Plan	3	3
	Financing - U7	0	0
	Financing - U8	3	3
	Unfunded	0	0
PURCHASE AFRIDEV 30 m SETTING (EXISTING WELLS)	Plan	2	2
	Financing - U7	0	0
	Financing - U8	2	2
	Unfunded	0	0

**ANNEX B,  
DNA PRONAR  
Plan of action, Phase II**

**WATER SUPPLY FOR DROUGHT RELIEF  
PRELIMINARY PROJECT PROPOSAL  
PHASE II**

**NATIONAL RURAL WATER SUPPLY PROGRAMME**

proposal 15/04/1992

PHASE IIa PHASE IIb PROVINCE	PROVINCE												TOTAL IIa	TOTAL IIb
	G A Z A	I N H A M B A N E	M A N I C A	M A P U T O	T E T E	S O F A L A	Z A M B É Z I A	M A P U T O	T E T E	S O F A L A	M A N I C A	I N H A M B A N E		
ACITON														
Procurement of light percussion drilling rigs (Dando UK 175) "Jumper rigs", with a capacity to 60 m depth, complete with bits, cable, 60 m of 6" working tubing, accessories, and spare parts for three years of operation	1	1	1	0	0	1	1	1	1	1	1	1	4	6
Procurement of water tank trailers, 2000 liter capacity (for drilling rigs)	1	1	1	0	0	1	1	1	1	1	1	1	4	6
Procurement of small compressor with tripod, pipes, accessories and spare parts for three years of operation	1	0	0	0	0	1	1	1	1	0	0	0	2	3
Procurement of basic equipment, tools, and safety equipment	1	1	1	0	0	1	1	1	1	1	1	1	4	6
Procurement of borehole casing PVC pipes (in metres)	600	600	600	0	0	600	600	600	600	600	600	600	2400	3600
Procurement of cement (in bags of 50 kg)	180	180	180	0	0	180	180	180	180	180	180	180	720	1080
Construction costs for completed boreholes (x US\$1000)	60	60	60	0	0	60	60	60	60	60	60	60	240	360
Procurement of Afridev Handpumps, 30 m setting	15	15	15	0	0	15	15	15	15	15	15	15	60	90
Training and misc. expenses (x US\$1000)	5	5	5	0	0	5	5	5	5	5	5	5	20	30
Procurement of 4WD light vehicles	1	1	1	0	0	1	2	2	2	1	1	1	4	9
Varied emergency interventions on existing rural small piped water systems (x US\$1000)	0.0	30.0	0.0	30.0	40.0	35.0	30.0	20.0	30.0	30.0	40.0	30.0	135.0	180.0

**NATIONAL RURAL WATER SUPPLY PROGRAMME**

proposal 15/04/1992

PHASE IIa PHASE IIb PROVINCE	TOTAL		VALUE US\$	
	PHASE IIa	PHASE IIb	PHASE IIa	PHASE IIb
ACTION				
Procurement of light percussion drilling rigs (Dando UK 175) "Jumper rigs", with a capacity to 60 m depth, complete with bits, cable, 60 m of 6" working tubing, accessories, and spare parts for three years of operation	4	6	\$200,000	\$300,000
Procurement of water tank trailers, 2000 liter capacity (for drilling rigs)	4	6	\$12,000	\$18,000
Procurement of small compressor with tripod, pipes, accessories and spare parts for three years of operation	2	3	\$48,000	\$72,000
Procurement of basic equipment, tools, and safety equipment	4	6	\$20,000	\$30,000
Procurement of borehole casing PVC pipes (in metres)	2400	3600	\$20,400	\$30,600
Procurement of cement (in bags of 50 kg)	720	1080	\$3,960	\$5,940
Construction costs for completed boreholes (x US\$1000)	240	360	\$240,000	\$360,000
Procurement of Afndev Handpumps, 30 m setting	60	90	\$38,376	\$57,564
Training and misc. expenses (x US\$1000)	20	30	\$20,000	\$30,000
Procurement of 4WD light vehicles	4	9	\$66,000	\$148,500
Varied emergency interventions on existing rural small piped water systems (x US\$1000)	135.0	180.0	\$135,000	\$180,000

ADMINISTRATION AND MANAGEMENT COSTS	\$48,224	\$73,956
<b>TOTAL IN US\$</b>	<b>\$851,960</b>	<b>\$1,306,560</b>

**ANNEX C,**  
**DNA**  
**Plan of action, Chimoio**

**NATIONAL DIRECTORATE OF WATER (DNA)**

**URBAN WATER SUPPLY CITY OF CHIMOIO  
EMERGENCY PLAN OF ACTION**

**ACTIONS TO BE UNDERTAKEN:**

ITEM	DESCRIPTION	Q	Un	EXECUTOR	DURATION WEEKS	COSTS Mt*1000	USD
1	Purchase of electropumps type SP8A-NE to be installed on existing boreholes near treatment plant.	2	Un	DNA	12	35.000	
2	Purchase of electropumps type SP5A-NE to be installed on existing boreholes near treatment plant.	1	Un	DNA	12	12.000	
3	Installation of Electro-pumps type SP8A-NE and SP5A-NE	3	Un	EPAR-Manica	8	10.000	
4	Construction costs for new deep boreholes near army barracks	2	Un	EPAR-Manica	8	19.000	
5	Geophysical study	1	Un	DRH/DNA	2	16.000	
6	Construction costs for new deep boreholes near treatment plant	2	Un	EPAR-Manica	4	19.000	
7	Procurement of electro pumps type SP8A-NE, borehole treatment plant	2	Un	DNA	12	35.000	
8	Installation of electropumps type SP8A-NE, borehole treatment plant	2	Un	EPAR-Manica	8	6.600	
9	Procurement pipes 100 mm diameter to link pumps to treatment plant	1000	M	DNA	12		10.000
10	Accessories for GI pipes			DNA			3.150
11	Procurement of electro pumps, type SP8A-NE, borehole near army barracks	2	Un	DNA	12	35.000	
12	construction costs pump houses	7	Un	EPAR-Manica	12	21.000	
13	Installation costs electro pump, type SP8A-NE, borehole near army barracks	2	Un	EPAR-Manica	8	6.600	
14	Procurement pipes 100 mm diameter to link pumps near army barracks	300	M	DNA	12		3.000
15	Accessories for GI pipes			DNA			1.050
16	Installation pipe 100 mm diameter near army barracks	300	M	EPAR-Manica	2	1.500	
17	Installation pipe 100 mm diameter near treatment plant	1000	M	EPAR-Manica	4	5.000	
18	Procurement 8" borehole casing	250	M	DNA	12		9.750
<b>SUBTOTAL URBAN</b>						<b>221.700</b>	<b>26.950</b>
<b>10% CONTINGENCY</b>						<b>22.170</b>	<b>2.695</b>
<b>TOTAL URBAN</b>						<b>243.870</b>	<b>29.645</b>

Total budget Urban (Mt and US\$) in US\$ (1US\$=2.200Mt) = ±

141000 US\$

**NATIONAL DIRECTORATE OF WATER (DNA)**

**PERI-URBAN WATER SUPPLY CITY OF CHIMOIO  
EMERGENCY PLAN OF ACTION**

POPULATION – 98.000

ACTIONS TO BE UNDERTAKEN:

ITEM	DESCRIPTION	Q	Un	EXECUTOR	DURATION WEEKS	COSTS Mt*1000	USD	
1	Construction costs for new deep borcholes	10	Un	EPAR – Manica	12	95.000		
2	Procurement and instalation of AFRIDEV handpumps	10	Un	EPAR – Manica	26	9.000	8.200	
3	Repair of handpumps, installed on existing wells and borcholes	10	Un	EPAR – Manica	10	2.500		
4	Construction of completed standposts	2	Un	EPAR – Manica	12	10.000		
5	Procurement and instalation of 2" GI pipes and accessories	1500	M	EPAR – Manica	12	3.750	8.500	
						SUBTOTAL PERI URB.	120.250	16.700
						10 % CONTIGENCY	12.025	1.670
						TOTAL PERI URB.	132.275	18.370

Total budget for Peri – Urban (Mt and US\$) in US\$ (1US\$=2.200Mt) = ±

79000 US\$

ANNEX D,  
DNA  
Plan of action, Quelimane

**NATIONAL DIRECTORATE OF WATER (DNA)**

**URBAN WATER SUPPLY SCITY OF QUELIMANE  
EMERGENCY PLAN OF ACTION**

**ACTION TO BE UNDERTAKEN:**

ITEM	DESCRIPTION	Q	Un	EXECUTOR	DURATION WEEKS	COSTS Mt*1000	USD
<b>1</b>	<b>BORÉHOLES</b>						
1.1	Construction costs new boreholes	4	Un	GEOMOC		128.000	
1.2	Transport of equipment GEOMOC	Freight		GEOMOC		16.000	
				<b>SUBTOTAL 1</b>		144.000	
<b>2</b>	<b>PUMP HOUSES</b>						
2.1	Construction costs pump houses	4	Un	E.A.Q *)		12.000	
				<b>SUBTOTAL 2</b>		12.000	
<b>3</b>	<b>ELECTRO PUMPS</b>						
3.1	Procurement Electropump BP 75-6	4	Un	DNA			44.170
3.2	Instalation electropump	4	Un	HIDROMOC		10.000	
				<b>SUBTOTAL 3</b>		10.000	44.170
<b>4</b>	<b>ELECTRICITY</b>						
4.1	Instalation high voltage aerial cables 33 Kv	2	Km	EDM **)		40.750	
4.2	Instalation low voltage cables	0,5	Km	EDM		9.000	
4.3	Procurement transformer	1	Un	EDM			8.000
4.4	Low voltage distribution box	1	Un	EDM			5.000
				<b>SUBTOTAL 4</b>		49.810	13.000
<b>5</b>	<b>MAIN PIPE LINE</b>						
5.1	Diámetro 350 mm, procurement	1100	m	DNA			97.170
5.2	Diámetro 300 mm, procurement	500	m	DNA			30.920
5.3	Diámetro 250 mm, procurement	500	m	DNA			22.080
5.4	Accessories for main pipe line			DNA			30.034
5.5	Instalation costs main pipe line					170.000	
				<b>SUBTOTAL 5</b>		170.000	180.204
				<b>SUBTOTAL 1-5</b>		385.810	237.374
				<b>10% CONTIGENCY</b>		38.581	23.737
				<b>TOTAL QUELIMANE</b>		424.391	261.111

Total budget, Urban, (Mt and US\$) in US\$ (1 US\$ = 2.200 Mt) = ±

455000

\*) E.A.Q = City Water Company

\*\*) EDM = Electricity Company

**ANNEX E,**  
**DNA**  
**Plan of action, Xai – Xai Chokwe**

NATIONAL DIRECTORATE OF WATER (DNA)

PERI URBAN WATER SUPPLY CITIES OF XAI-XAI AND CHOKWE  
EMERGENCY PLAN OF ACTION

ACTIONS TO BE UNDERTAKEN

ITEM	DESCRIPTION	Q	Un	USD
1	EQUIPMENT AND MATERIALS			
1.1	Procurement of 4WD 5 ton. truck with 15% of spareparts	2	Un	111.090
1.2	Procurement of 4WD 1 ton. light vehicle with 15% of spareparts	2	Un	52.900
1.3	Procurement of motobike 50 cc, with 15% of spareparts	4	Un	12.650
1.4	diesel engine powered welding generator	2	Un	15.180
1.5	Compressor	2	Un	4.600
1.6	Compleat submersible pump	1	Un	13.800
1.7	Complete surface pump	2	Un	11.500
1.8	Elevated watertank	2	Un	13.800
1.9	Asbestos-cement pipes and accessories			16.100
1.10	HDPE pipes and accessories			77.050
1.11	Tools sets (brickworker, pipe fitter and general maintenance)			31.050
1.12	Tools sets for maintenance caretaker			12.650
1.13	Construction materials (cement, construction iron etc)			15.525
1.14	Office material			4.600
1.15	Preventive maintenance			6.900
1.16	Contingency			41.055
	TOTAL XAI-XAI e CHOKWE			440.450

ANNEX F,  
DNA  
Plan of action. Beira

**NATIONAL DIRECTORATE OF WATER (DNA)**

**URBAN WATER SUPPLY CITY OF BEIRA  
EMERGENCY PLAN OF ACTION**

<b>1. TRUCKS</b>	
1 truck =	10 ton
Total cargo to be transported = $7680 \text{ m}^3 \cdot 2.5 \text{ ton/m}^3 =$	19200 ton
1 truck makes 8 trips per day =	80 ton
N° of trucks/day =	240 un
Costs for trucks = $240 \cdot 500 \text{ 000,00 mt} =$	120.000 Mt*1000
<b>2. BULLDOZER D8</b>	
Joining ground at extraction plant	
Production/day =	100 m <sup>3</sup>
N° of bulldozers/day = $7680 / 100 =$	76,8 un
Costs of bulldozers = $76,8 \cdot 8h \cdot 80 \text{ 000,00 mt/h} =$	49.152 Mt*1000
<b>3. WHEEL LOADER 926</b>	
Loading trucks at extraction plant	
Production/day =	160 m <sup>3</sup>
N° of loads/day = $7680 \text{ m}^3 / 160 \text{ m}^3/\text{day} =$	48 un
Costs of wheelloaders = $48 \cdot 8h \cdot 60 \text{ 000,00 mt/h} =$	23.040 Mt*1000
<b>4. BULLDOZER D8</b>	
Dozing and compactation from river margin to dam.	
Production/day =	30 m <sup>3</sup>
N° of bulldozers/day = $7680 \text{ m}^3 / 30 \text{ m}^3/\text{day} =$	256 un
Costs of bulldozers = $256 \cdot 8h \cdot 80 \text{ 000,00 mt/h} =$	163.840 Mt*1000
<b>5. EMERGENCY SPILLWAY</b>	
At the central dam area a spillway will be constructed	
4 pipes of 0.70 m and the off stream dam protection.	
Cost of 4 pipes 0.70 m = $4 \cdot 500 \text{ 000,00 mt} =$	2.000 Mt*1000
Cost of 15 protection units = $15 \cdot 200 \text{ 000 mt} =$	3.000 Mt*1000
Cost of stones to fill the protection units = $15 \text{ m}^3 \cdot 20 \text{ 000,00 mt} =$	300 Mt*1000
Total Cost spill way =	5.300 Mt*1000
<b>6. BOWKER CANAL</b>	
Total lenght = 7100 m	
Cleaning 5400 m / Deepening 1100 m / Digging of 600 m	
Cleaning costs (5400 m) = $270 \text{ man/day} \cdot 1500,00 \text{ mt} =$	405 Mt*1000
Deepening costs (1100 m) = $600 \text{ man/day} \cdot 1500,00 \text{ mt} =$	640 Mt*1000
Digging costs (600 m) = $600 \text{ man/day} \cdot 1500,00 \text{ mt} =$	900 Mt*1000
Total cost of canal =	1.945 Mt*1000
<b>7. ACCESS ROAD</b>	
1 km of road needs to be repaired to get access to the dam area to be able to circulate with equipment	
One working day for the following machines	
1 bulldozer = $8h \cdot 80 \text{ 000,00 mt/h} =$	640 Mt*1000
1 pa wheelloader = $8h \cdot 60 \text{ 000,00 mt/h} =$	480 Mt*1000
1 grader = $8h \cdot 80 \text{ 000,00 mt/h} =$	640 Mt*1000
3 trucks = $3 \cdot 500 \text{ 000,00 mt/dia} =$	1.500 Mt*1000
Total cost acces road =	3.260 Mt*1000
<b>8. OTHER COSTS</b>	
Transport of machinery to the dam area = $120 \text{ 000,00 mt/h} =$	2.400 Mt*1000
Accident insurance =	2.000 Mt*1000
Salaries for workers =	5.000 Mt*1000
Supervisor salary =	15.000 Mt*1000
TOTAL other costs	24.400 Mt*1000
<b>TOTAL COSTS 1-8 =</b>	<b>390.937 Mt*1000</b>
<b>Contigencies = 30% of total =</b>	<b>117.281 Mt*1000</b>
<b>TOTAL COST OF DAM =</b>	<b>508.218 Mt*1000</b>

Total budget in US\$ (1US\$=2.200 Mt) = ±

232.000 US\$

## Appendix D

### POPULATION ESTIMATES

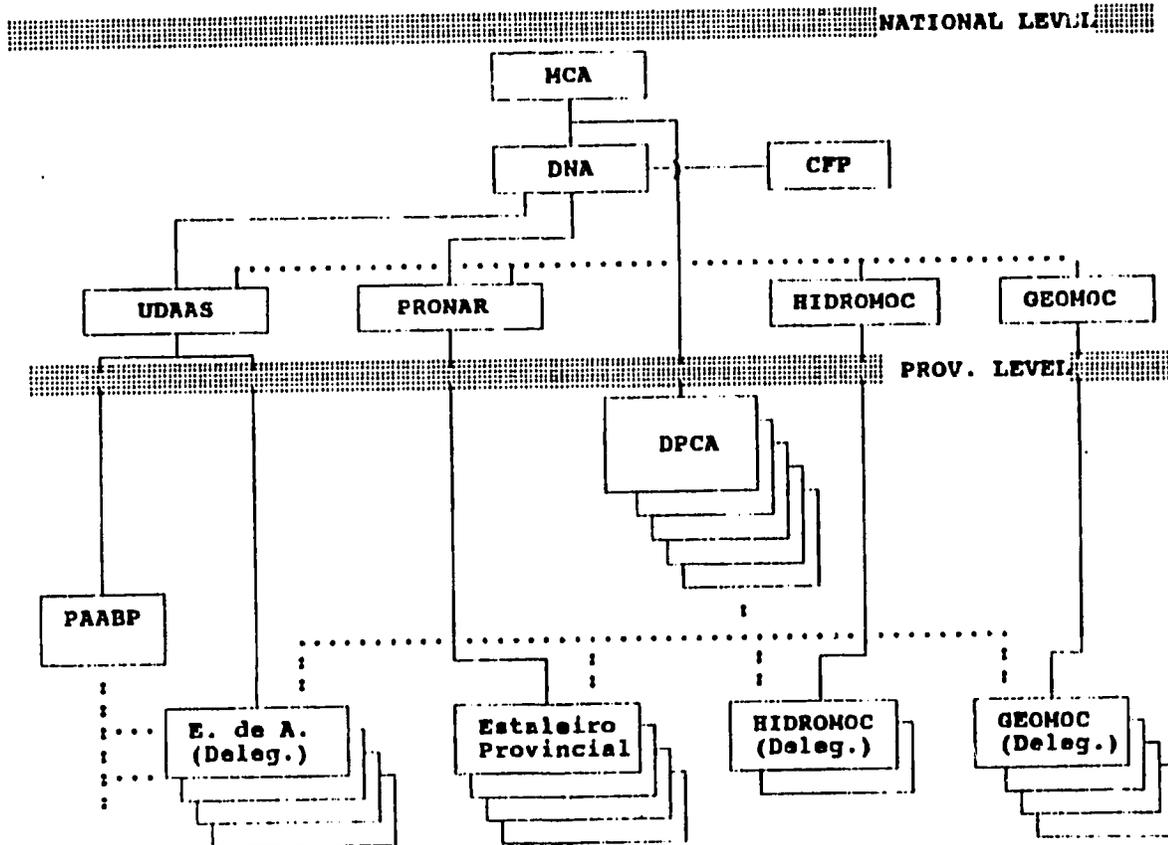
<b><i>Province</i></b>	<b><i>Population</i></b>	
Maputo	1,616,400	
Gaza	1,284,600	
Inhambane	1,293,700	
Sofala	1,381,600	
Manica	831,200	
Tete	+ <u>1,076,900</u>	
Subtotal most affected areas ---	<b>7,484,400</b>	(48%)
Zambezia	3,241,800	
Nampula	3,117,400	
Niassa	666,600	
Cabo Delgado	+ <u>1,219,800</u>	
Subtotal less affected areas ---	+ <b><u>8,245,600</u></b>	(52%)
<b>TOTAL</b>	<b>15,730,000</b>	(100%)

<b>City</b>	<b>Population</b>
Maputo	1,650,000
Xai-Xai	73,800
Inhambane	114,400
Chimoio	100,300
Beira	324,600
Quelimane	142,400

**Appendix E**

**WATER SECTOR ORGANOGRAM**

# THE WATER SECTOR IN MOZAMBIQUE ORGANIZATION CHART



## LEGEND:

MCA - Ministry of Construction & Water	— direct control
DNA - National Directorate for Water	... indirect control
CFP - Professional training centre of DNA	
HIDROMOC - State Hydraulic Equipament Company	UNICEF tech. input
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	

**Appendix F**

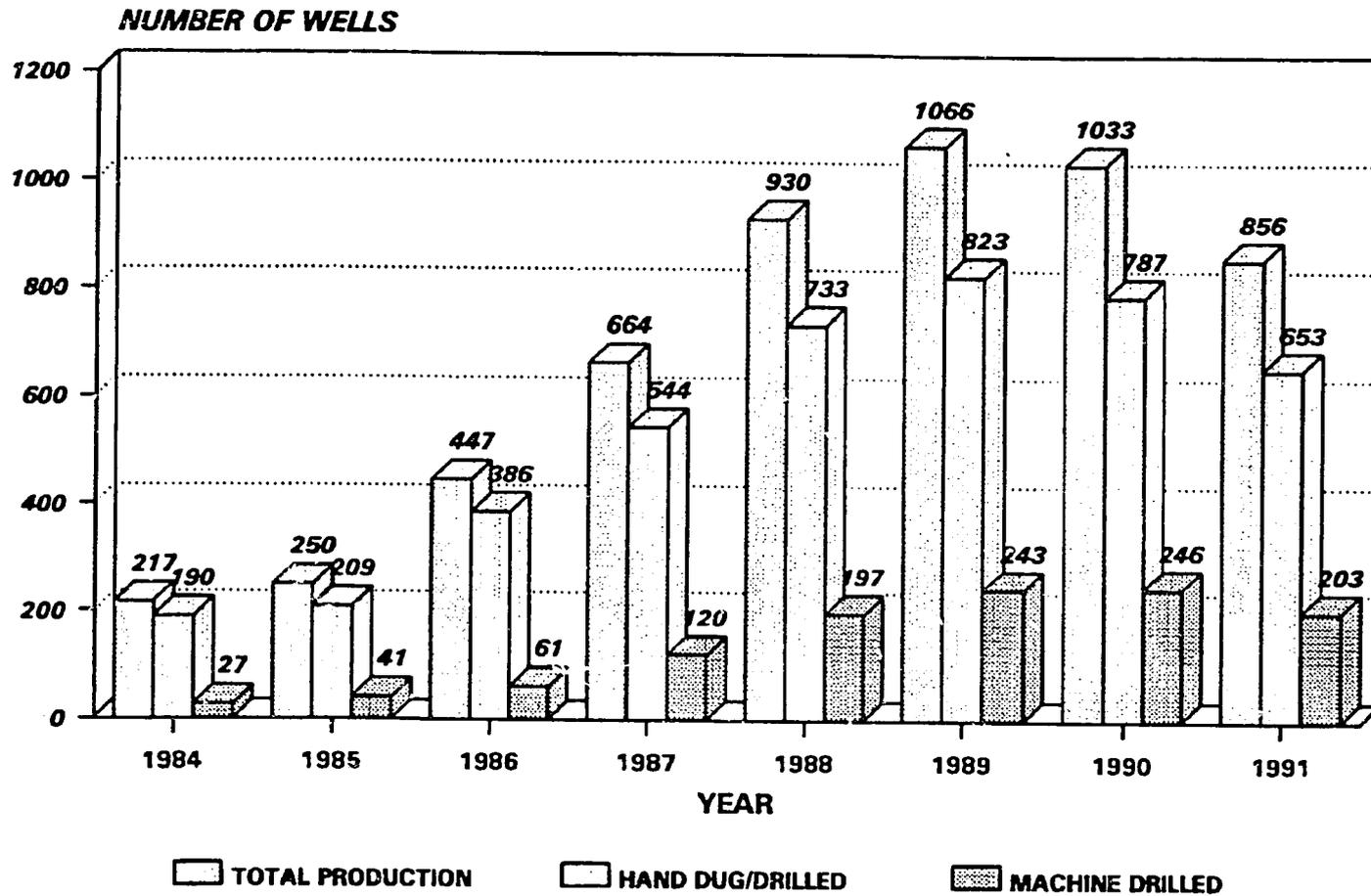
**PRONAR WATER WELL PRODUCTION, 1984-1991**

# NATIONAL RURAL WATER SUPPLY PROGRAMME

## WATER WELL PRODUCTION 1984 -1991

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77



SOURCE: PRONAR

## Appendix G

### GEOMOC DRILLING RIGS INVENTORY IN AFFECTED PROVINCES

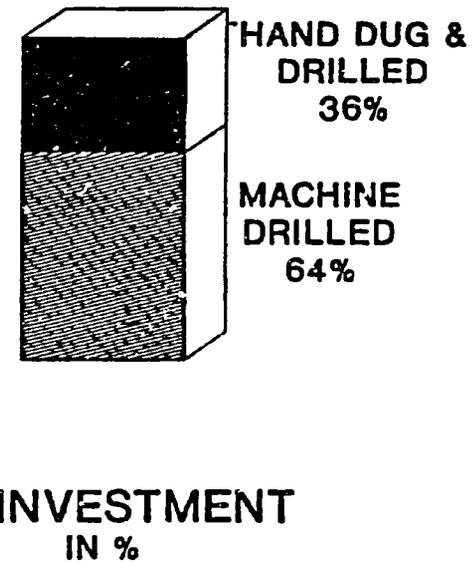
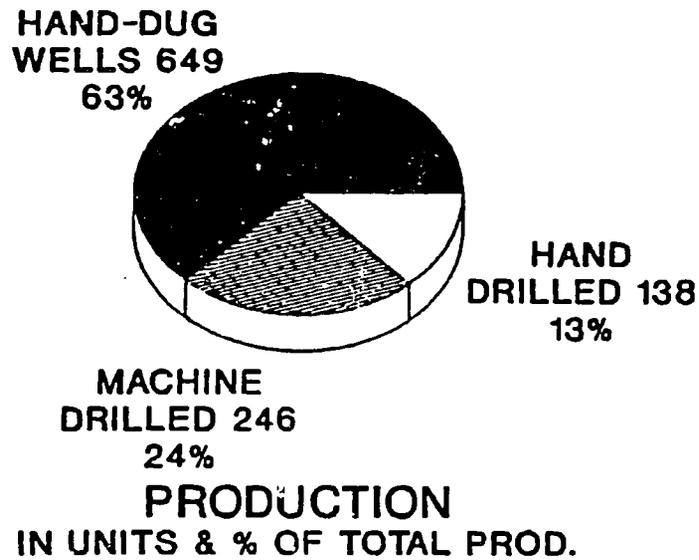
<i>Province</i>	<i>Drilling Rigs</i>
TETE	3 Percussion 1 Rotary (Ingersoll)
SOFALA	3 Percussion 1 Rotary
INHAMBANE	5 Percussion 2 Small Percussion 1 Rotary
GAZA	8 Rotary (Russian)
MAPUTO	3 Rotary 1 Percussion
MANICA	5 Percussion
<b>TOTALS</b>	<b>19 PERCUSSION RIGS</b> <b>14 ROTARY RIGS</b>

Source: GEOMOC (May 1992)

**Appendix H**

**PRONAR 1990 PRODUCTION, WELLS DEVELOPMENT**

# NATIONAL RURAL WATER SUPPLY PROGRAMME PRODUCTION 1990



SOURCE: PRONAR

## Appendix I

### SCHEDULE AND INDIVIDUALS INTERVIEWED

#### **Saturday, April 25**

15:00 Departed Washington, D.C.

#### **Sunday, April 26**

21:00 Arrived Maputo

#### **Monday, April 27**

11:00 Agency for International Development (A.I.D.):

Mary Pat Selvaggio Health, Population, and Nutrition Officer

Sidney Bliss Project Development Officer

Cheryl McCarthy Program Officer

#### **Tuesday, April 28**

08:30 National Rural Water Supply Program (PRONAR) and UNICEF:

##### **PRONAR**

Daniel Malembe Acting Director

Eric Callier Small Piped Systems Engineer

Leo Stolk Wells and Boreholes Engineer

##### **UNICEF**

Peter Wurzel Chief, Water and Sanitation

Greg Keast Project Officer, Water and Sanitation

11:00 Food for the Hungry International:

Shaun Walsh Country Director

14:00	<b>World Vision:</b>	
	Tim Andrews	Administrative Manager
	Jonathan White	Program Coordinator for Agricultural Recovery/Provincial Representative
16:00	<b>Lomaco (Lomrho Mozambique):</b>	
	Michael Burgess	Agronomist

**Wednesday, April 29**

08:30	<b>CARE:</b>	
	Christy Gavitt	Assistant Country Director (Program)
	Rosmarie Moreken	Food Program Monitoring Officer
10:00	<b>National Directorate for Water:</b>	
	Juliao Alferes	Director
14:00	<b>Profabril (AGRIPRO):</b>	
	Luis Loureiro	Engineer
16:00	<b>A.I.D.:</b>	
	Sidney Bliss	Project Development Officer
	Mary Pat Selvaggio	HPN Officer

**Thursday, April 30**

10:30	<b>A.I.D.:</b>	
	Julius Schlotthauer	Director
	Jack Miller	Deputy Director
	Buddy Dodson	Food for Peace Officer
	Mary Pat Selvaggio	HPN Officer

Peter Argo                      Engineering Officer  
Sidney Bliss                     Project Development Officer

14:00      UNICEF:

Paulo Oscar Monteiro        Sanitation Officer  
Greg Keast                      Project Officer, Water and Sanitation  
Leo Stalk                        Wells and Boreholes Engineer, PRONAR

**Friday, May 1**

10:00      A.I.D.:

Peter Argo                      Engineering Officer

**Monday, May 4**

09:00      UDAAS (Association of Water Companies):

Jose Santana                  Director

15:00      GEOMOC, E.E. (State Water Drilling Corporation):

Mariamo Cassamo             Director General (Acting)  
Castro Sousa                  Coordinator of Projects  
Nico George                     Chief of Production Division

**Tuesday, May 5**

15:00      SOMOCON:

Filipe Gradil                  Director  
Joao Luis Cavilhas             Civil Engineer (Hidrotecnical Portugesa)

**Wednesday, May 6**

09:00      CARE & USAID:

Joe Kessler                     Country Director, CARE  
Peter Argo                      Engineering Officer, USAID

**Thursday, May 7**

11:00 UNICEF:

Peter Wurzel	Chief, Water and Sanitation
Greg Keast	Project Officer, Water and Sanitation

**Friday, May 8**

14:00 USAID:

Julius Schlotthauer	Director
Jack Miller	Deputy Director
Buddy Dodson	Food for Peace Officer
Mary Pat Selvaggio	HPN Officer
Peter Argo	Engineering Officer
Sidney Bliss	Project Development Officer

**Monday, May 11**

07:00 CARE, USAID:

Joe Kessler	Country Director, CARE
Christy Gavitt	Assistant Country Director (Program), CARE
Mary Pat Selvaggio	HPN Officer, USAID
Dennis Long	Environmental, USAID (Washington), Health Officer

11:00 UNICEF:

Greg Keast	Project Officer, Water and Sanitation
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16:00 Departed Maputo

**Tuesday, May 12**

15:00 Arrived Washington