

National Urban Water Corporation, the Sudan

Directorate-General International Cooperation, the Netherlands

Sustainable Water Supply Systems in Small Cities



The Lessons from Darfur

Volume I: Main Text

June 1994

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Euroconsult, Arnhem, the Netherlands

ISBN 12661
824 50094 (Vol. I)

SUSTAINABLE WATER SUPPLY SYSTEMS IN SMALL CITIES

THE LESSONS FROM DARFUR

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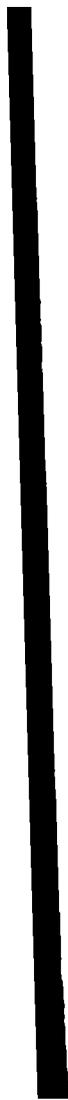
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PREFACE

At the end of 1993, one of the most interesting Dutch financed projects in the Sudan came to an end. From 1986 till the end of 1993, the Dutch Government provided financial and technical assistance to the National Urban Water Corporation (NUWC) of the Sudan. This assistance was aimed at expanding drinking water infrastructure in two towns in the state of Darfur and, at a later stage, at strengthening the institutions involved with this infrastructure at local and state level.

The challenge of this project was to leave behind physical and institutional arrangements that will survive on their own strengths: the strengths of physically sound facilities, effective local organizations, responsible consumers and financial arrangements which ensure long-term sustainability.

In the course of this project, technical, financial and institutional problems were taken up that are typical of water corporations and similar organizations at the municipal and regional level. Darfur is not the only setting in which such problems arise, and the Sudan is not the only country. But this project might be exceptional because of the systematic, intensive, and relatively successful way in which these problems have been approached. And it might be unusual because the process of assistance has been carefully monitored and well documented.

Through this document we would like to share with other professionals involved in this field how the challenge has been taken up. This document summarizes the lessons from seven years of collaboration between the NUWC and Euroconsult. In the first volume, an overview is given of the various phases, activities and achievements of the project. In the second volume, some of the specific tools, developed in the course of our collaboration, have been documented. These are forms, manuals, sheets for Management Information Systems or Accounting Systems, etc. Whereas this second volume could be of immediate interest to practitioners, directly associated with small- and medium-sized urban water corporations, the first volume may be interesting to all who have more general responsibilities for establishing or assisting utility companies in developing countries.

We would like to thank our colleagues in the Sudan for all the years of positive and effective collaboration. We hope that they have learned as much as we did. We also want to thank our colleagues in the Dutch Directorate-General International Cooperation (DGIS), who not only arranged for timely financial support, but who always provided a stimulating sounding board and who inspired us to keep the long-term view in mind.

We hope that this document contributes to a better understanding of the scope and limitations of external assistance to local institutional development. We welcome responses and enquiries and we hope to continue learning and sharing.



General View of Nyala Town



Water for the Family

EXECUTIVE SUMMARY

This document is a comprehensive report on the activities of the Water Supply Extension Project (WSEP, 1986-1993) and the Institutional Strengthening and Management Development Project (ISMDP, 1989-1993), both of which assisted the National Urban Water Corporation (NUWC) in the towns of Nyala and El Geneina in Darfur State. The Dutch Government provided financial support for all material and technical assistance inputs

A need for much more water

The huge influx of rural people into these two towns during the last decade resulted in an annual growth in population of more than 12%. Both towns already had a piped water system which served the older town centres and some local institutions. NUWC and the towns had not been able to increase the piped-water supply capacity, and more and more people came to rely on water vendors or on their own efforts to get water. During the 1984-1985 drought even more people took refuge in Darfur's urban centres while possibilities for obtaining water were minimal. Even vendors with animal-drawn carts could not supply enough. Water consumers who depended on these vendors had to spend a very large part of their income on water that was of a much lower quality than piped water.

Enough water under wadi

Surveys had indicated that sufficient water was collected and stored in the wadi aquifers every year to continuously supply the population of the two towns. As most of the recent settlers were now staying in semi-permanent structures, these people could only be helped with low-cost water supply systems such as those based on public standpipes.

Foreign assistance

The Sudanese Government requested the Dutch Government to allocate part of the assistance offered as a response to the western Sudan drought disaster to the extension of urban water supply in Nyala and El Geneina. Building on recommendations from recent studies, it was decided that, using a phased approach, networks of public standpipes (kiosks) were to cover the areas which were entirely deprived of piped water. Extra boreholes were to be drilled and major new pipelines had to connect the sources with the distribution points. As distances in Nyala were considerable, special booster pumps were to be installed in an already existing pump house. Kiosks with taps for collective use would enable NUWC to deliver water of a good quality at low cost close to a large number of homes.

NUWC National Projects Office awarded contract

NUWC, through its National Projects Office, was awarded the contract to carry out the actual construction work, and the Dutch consultancy firm, Euroconsult, was engaged for planning, technical advice and logistic support of a more

international character. This was to complement the local logistic support tasks assigned to the National Projects Office. Euroconsult was to provide two technical advisers.

Factors limiting progress

A year after the Water Supply Extension Project had started, it became obvious that progress was much less than had been anticipated. The Sudanese Government had to finance the cost of borehole drilling, local staff and labour, and as disbursements to the project were very slow, especially trench digging and pipe laying were much delayed. It was very difficult, and often impossible, to attract enough local labour for the hard trenching work at the obligatory government-set rates. When many technical supervisory staff from NUWC's National Projects Office were required, they were not available, and the Resident Engineer lost much valuable time in Khartoum trying to speed up the liberation of funds.

Second phase to catch up and rehabilitate existing infrastructure

As WSEP had suffered considerable delays in Nyala as well as in El Geneina during its initial years, the next phase of the project would focus on completion of the activities that had already been started and on rehabilitation of existing installations. This rehabilitation especially involved replacing the weakest elements in the distribution pipeline system, which not only caused serious water losses, but also demanded frequent repairs, particularly during the rainy seasons.

Third phase to complete the WSEP objectives

Four years after the start of the project, only two of the four targeted areas in Nyala had been provided with community kiosk systems and the other two were still in dire need. In the third phase a large looped pipeline was to be built to connect the major well-fields with the distribution mains. To balance production with demand, a large (800 m³) overhead storage tank was to be built near Nyala's central pump house. In El Geneina and Adarmata, at the beginning of the third phase, the kiosks were operational, but not all the boreholes were connected by pipelines and powerlines; generator buildings still had to be constructed and the system of distribution mains was far from complete.

The completion of WSEP

By November 1993, almost all the work in Nyala had been completed. By this date, only about 30% of the work in the hai El Geer, the last target area to be provided with kiosks, remained to be finished. The project had been extended after the deadline of December 1992, when the foreign donor did not extend the funding for a technical advisor. In El Geneina the plans had been modified frequently and towards the end, when the project could no longer closely supervise activities, they lacked direction. Unfortunately, not all boreholes are operational as planned and the main distribution system has not been completed.

The organization needs improvement too

In 1988, a Dutch mid-term review mission recorded the poor performance of NUWC Nyala in operations and maintenance. The mission concluded that training of personnel, filling of key positions, maintenance and water fee collection rate, all needed much improvement to sustain successful operation of the extensions made under WSEP. It was recommended that a study should be made by the consultant concerning the institutional aspects of NUWC Nyala.

Pilot project

On the basis of this study, a "pilot project" would be carried out in order to develop a methodology which could be applied in other towns in the Sudan. A pilot project would allow some freedom in tariff-setting and introduction of water fees, based on cost recovery. The Dutch Government could give technical assistance with respect to training, organizational development, revenue collection and community participation.

The Institutional Strengthening and Management Development Project

One year after the start of Institutional Strengthening and Management Development Project (ISMDP), a review mission of the Dutch Government suggested that NUWC Nyala should become a Water Supply Company. By strengthening existing functions (such as production, distribution, revenue collection, operations and maintenance), and developing new functions (such as design, planning and construction, consumer relations, staff development and training), the corporation was to become self-supporting. The mission also recommended to accelerate the integration of the technical project (WSEP) and the organizational project (ISMDP).

Formation of kiosk committees

ISMDP started out to help install user committees with members from the population living near the kiosks, who would look after the operation, the use and hygienic conditions of the newly constructed kiosks. This could move the major load of managing the kiosks from NUWC to the kiosk committees. NUWC appointed a special representative (later even more than one) to interface with the kiosk committees.

A path towards greater autonomy

ISMDP prepared for NUWC Nyala an "Enterprise Development Plan" which outlined a path towards greater autonomy and operational freedom of NUWC Nyala. This EDP aimed at a situation whereby NUWC Nyala would be self-financing within three or four years. The EDP was officially presented during a one-day conference in Khartoum.

Institutional Capability Index

To measure how well an organization is functioning, the project developed the Institutional Capability Index (ICI). This instrument can help to estimate how well a town's water corporation operates and, if applied at certain intervals, it can

show the progress that is made in improving operational efficiency.

Monthly management meetings

As communication between the management and the operational sections left much to be desired, monthly management-team meetings were to become a regular feature. However, as was to be expected initially, this formalized communication and feedback channel did not function too well.

Management Information System

As an instrument to guide management decision making, a system of management information sheets (MIS) was instituted, which presents monthly key indicators of engineering works, financial status and staff issues on one sheet of paper. Comparison of the data from month to month will show the effect of the management decisions that have been taken.

From daily to weekly collection

The project helped design sets of forms to monitor the flow of water to the kiosks and the revenue that is generated. It was soon learned that daily collection of the kiosk revenues involved too much manpower and now they are collected only weekly.

Consultancy missions

Surveys held during consultancy missions confirmed that extending the kiosk network is the most cost-effective way to supply a large part of the town population with safe water and also that the consumers are ready to pay the cost of water. Other consultancy missions underlined the need for the introduction of a universally accepted "double-entry commercial accounting" system. An upgrade to this system is essential to derive information for appropriate management decision-making.

Household survey

As data on household connections had not been kept up-to-date for a long time, ISMDP instituted a survey of all households in Nyala during which block numbers and house numbers were assigned and painted, key characteristics recorded and compared with those of the consumer accounts section.

Staff training

During the first two years of ISMDP, 24 technicians were trained in four- to six-week courses at the Nyala Technical High School, and a two-week course on "double-entry commercial accounting" was organized in Nyala and was attended by accountants from four towns in Darfur State.

Standard operations manuals

To serve as a guideline to operations and maintenance personnel in the production department, ISMDP organized the production of three standard operations manuals (SOPs). These were written in English as well as in Arabic.

Hygiene education and sanitation El Geneina	To complement the improved availability of safe water for household purposes in El Geneina, ISMDP gave support to the Irish NGO, Goal, which was involved in activities to promote hygiene education and sanitation.
Successes after two years of ISMDP	<p>The major <u>achievements</u> of the first two years of ISMDP were</p> <ul style="list-style-type: none"> - increase in revenue collection - successful and low-cost operation and management of kiosks - increase of public water supply through three new kiosks and one extra tanker filling point - improved operation of pumps, pipelines and kiosks
ISMDP extension	During the bilateral talks between the Sudanese Government and the Dutch Government of mid-1991, agreement was reached for continued funding for ISMDP until the end of 1993 or possibly the end of 1994.
Revenue collection needs constant attention	As the financial position of the two NUWC branch operations had deteriorated since December 1991, it deserved immediate attention. Management became interested in picking up some of the tasks of staff who had been away from their posts and whose tasks nobody had cared to assume. Only this refocused attention enabled NUWC Nyala to keep revenues over current expenditure over the next year and a half.
Too little charged for reconnection	Early in the project life, it became clear that NUWC tariffs were insufficient to cover any cost other than that of direct water supply. Although ISMDP advised to increase reconnection fees by five times to cover the actual cost to NUWC, after initially allowing this under the pilot project status, NUWC quickly issued directives to bring this charge back to more or less its previous level.
Water tariffs	Compared to Zalingei and El Geneina, water tariffs were more than adequate for Nyala, given its rather low cost structure. The real problem was the low collection rate. As the Nyala accounts department was not very effective, ISMDP advised, in addition to introducing some new systems, to improve the leadership and work discipline in this department. Towards the end of the project, this weakness had been addressed. By the summer of 1993, the new accounting system started to be introduced and more financial data became available for management through generation of special reports.
Reporting by sections	The introduction of a comprehensive "periodic section reporting system" improved the <u>information flow</u> to management and thus the possibility to monitor and intervene effectively.

High costs of operations in El Geneina	<p>The cost structure of El Geneina is completely different as all power has to be generated with small diesel generators. Although the arrangement of pumps and generators can be improved, the pumping costs will remain high, because El Geneina's remote location and bad road connections make fuel prices extremely high and supplies irregular and erratic. Differences in staff competence and numbers explain much of El Geneina's higher cost structure. As these costs cannot be met by water fee revenues, it is up to politicians to decide to raise tariffs above national tariffs or to provide special subsidies. If NUWC operations in Darfur State are to become financially self-sufficient, then Nyala as the urban centre that has the lowest cost structure will have to cross-subsidize the NUWC operations in the other towns of Darfur State. However, for this to happen, Nyala will run the risk of having insufficient funds to finance the expansion and improvement of its own services.</p>
Work-load and organization study	<p>A local consultant conducted a work-load and organization study. This study determined how adequately sections were staffed, how well the branch was structured and organized, and how well the organization communicates and has specified responsibilities. As the draft reports of this study did not completely describe the situation, ISMDP itself prepared small reports on the tasks, structure, work-load and staffing situation of each section. The project also designed a complete set of periodic section report forms, which became operational during the last year of the project. The new function of executive office manager was created to ensure proper completion, handing in and filing of these reports and to assist the management with the preparation of agendas and recording of minutes of meetings.</p>
Acting on new information	<p>By mid-1993, management started to draw its own conclusions from reporting on the sections which was highly structured by then. A salient example of this "acting on new information" was the conclusion drawn from reporting on the pipeline sections, which revealed that pipeline repairs were often in the same places, and that, 95% of the time, about 50% of the section's staff were not assigned to any duty. Combination of these two facts made management decide to revive a pipeline rehabilitation action which had started a year before and in which management and staff had lost interest. A rehabilitation programme for valve chamber developed along the same lines.</p>
Results of staff training	<p>The maintenance staff is progressively becoming more effective as a result of training, more and better tools and increased interest from management (through better monitoring). In 1992 and 1993, 24 maintenance staff received additional training at Nyala's Technical High School (THS), 18 accountants attended a refresher course in "double-entry</p>

commercial accounting", two dozen higher-level staff were trained on a variety of courses at the Management Development Centre (MDC) in Khartoum and two assistant mechanics got a four-month training at a Nyala vocational training centre

Tools and equipment

In 1992 and 1993, ISMDP organized the import of duplicators, typewriters, calculators, car parts, garage tools and garage equipment, as well as pipeline fitting tools. These new pipeline tools enabled the pipeline section to properly fit polythene pipe on metal couplings for the first time.

Management coaching

ISMDP continuously and consistently worked with NUWC management, both at State and town levels. It assisted in taking decisions on interpretation of observations and messages from the workforce, and in planning action for both the immediate and the long-term future. Although many decisions were made during these sessions, some have later been abandoned as implementation met with resistance. Unfortunately, the four-headed management team, consisting of one general manager (chief water engineer) and three heads of department, most often only found one or two members present on the job. The chief water engineer, who was officially appointed, was in Nyala only 50% of the time.

Important improvement in water service

Since the start of the projects, the service to the consumers in Nyala has significantly improved. Not only are about 100,000 more people served with piped water, also the regularity of service has reached very high levels. In contrast to earlier years, the water delivery at the end of the rainy season was not noticeably reduced. El Geneina is less fortunate as it receives insufficient fuel for pumping to be undertaken on a regular schedule, and thus each "hai" within the town receives water for only two days per week.

Nyala's financial independence

NUWC Nyala has turned from a subsidy-dependent branch into a provider of subsidies to other towns. With the benefits of recent staff changes in the accounts department, this branch's revenue will become ample, not only to cover recurrent expenses, but also to provide for equipment replacement and for payments to the provider of electricity.

Overstaffing

A quantitative work-load/staffing analysis in Nyala has revealed that some sections are much overstaffed. Without reorganization, about 65 out of 200 employees could be assigned to duties outside the water corporation in Nyala, without any loss of output. Nyala and other NUWC operations should not hire any new staff without considering whether a vacancy can be filled from inside, which can be done with the help of the completed personnel evaluation forms.

Lessons learned from the period 1986-1993

The last section of this document shows that many of the lessons learned during the lifetime of the projects can be applied in other towns, even if these do not enjoy the same level of technical and financial assistance.

Conference

In October 1993, NUWC and ISMDP held a two-day conference in Nyala for the management of other NUWC, National Rural Water Corporation and National Electricity Corporation branch operations, to share the experiences of WSEP and ISMDP. The Darfur Minister of Housing and Public Utilities and the Governor of South Darfur attended most of the sessions. Important parts of the conference were devoted to water resources management and the actual management of NUWC Nyala.

Video recording

Results of both projects in Nyala have also been recorded in a video film, which was produced in June 1993.



The Wadi Nyala



Source of Water for the Town

1 **INTRODUCTION**

The Water Supply Extension Project (WSEP) and the Institutional Strengthening and Management Development Project (ISMDP) were carried out in Darfur State in western Sudan. This chapter describes the geographical, infrastructural and economic background of the two towns in which the projects were operating, Nyala and El Geneina, and at the same time the original concept on which the projects were based.

Situation in 1986

Nyala and El Geneina are located in the most densely populated western and southern parts of Darfur State, which covers an area almost three-quarters the size of Kenya and has a population of approximately 4 million, according to the 1993 census. The remoteness of Darfur is striking: the distance overland between Nyala and the capital Khartoum is more than 1,300 kilometres. Although both towns are connected by rail, a one-way trip takes three days, and more than seven days during the rainy season. More than half of the road connection between Nyala and Khartoum is sand track.

From the 1970s onward, plans have been made for developing the remote areas of the Sudan. In western Sudan, however, not much was done. One of the major constraints was the inability of the local government to assist in developing the area. It lacked resources, funds, organizational capacity and know-how.

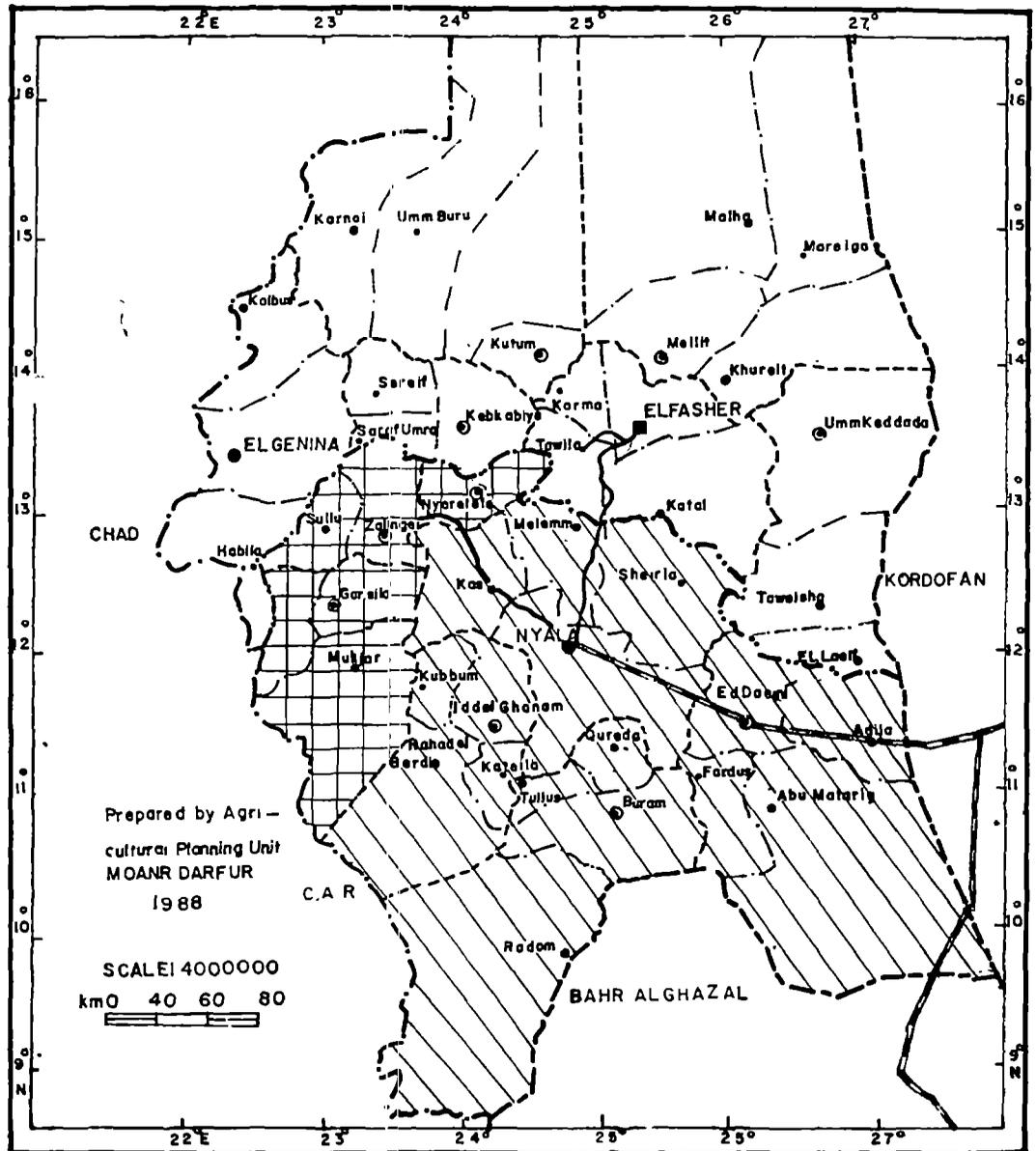
The south of Darfur has a semi-arid savannah climate while the north of Darfur is arid desert. The rainy season lasts from July until October. Rainfall varies from less than 200 mm a year in the north up to 1,000 mm in the extreme south.

1984-1985 drought

Following a trend of decreasing rainfall during the past thirty years, the extremely low rainfall in 1984-1985 struck the Darfur region with a famine in which more than 50,000 people died from starvation. The effects of the droughts were aggravated by the inability/inertia of the Government and by the slow response of aid agencies.

Strong migration to the towns

After the drought of 1984-1985, the town of Nyala experienced a large and rapid inflow of people who were forced to leave the drought-stricken areas of the region. These people settled in the town's fringe zone where no water supply or other amenities were available. Despite plans for the resettlement of migrants, spontaneous settlement took place on such a large scale that regulation was impossible.



- | | | |
|-----------------------------|--|-----------------------|
| International boundary..... | Railway..... | Regional HQ..... |
| Regional boundary..... | All weather route..... | Provincial HQ..... |
| Provincial boundary..... | WSDC Project area..... | Area Council HQ..... |
| Area Council boundary..... | JMRD Project area..... | Rural Council HQ..... |
| Rural boundary..... | EL Fasher-Nyala gravelly road Corrected in January 1989. | |

Map 1 Darfur State

Initially the fringe settlements consisted of temporary dwellings for living and shelter, mostly grass or mud huts with grass roofing. While some of the people, after the return of the rains, went back to their homes, others remained and the town's fringe population continued to grow. Gradually, the fringe settlements assumed a more permanent character.

The town of El Geneina, located near the border with Chad, also received a considerable inflow of displaced people. They came from the drought-stricken north-western Sudan and from across the Chad border. These people took occupation of the fringe zones of El Geneina. Some of them returned to their home-grounds later, but many stayed. At the same time there was a continuous inflow of people who were forced to leave their living areas also for other reasons, including war. As a result, the total population in and around El Geneina has greatly expanded.

Few people in towns had access to piped water

The piped water supply system in the project towns provided water to a relatively small part of the population. A large segment of the population had no access to a convenient and adequate supply of water. Most people depended on water delivery by water vendors who sell water drawn from unprotected sources or bought from water corporation kiosks. Considering the unhygienic conditions in and around the open wells and careless handling by vendors, much of the water is polluted. Moreover, water sold by vendors was extremely expensive, up to 15-20 times more expensive than water from the town's piped supply. Therefore people used as little water as possible, insufficient for domestic and personal hygiene. Health care and disease prevention were severely impaired by this lack of convenient supply of safe water in adequate quantities.

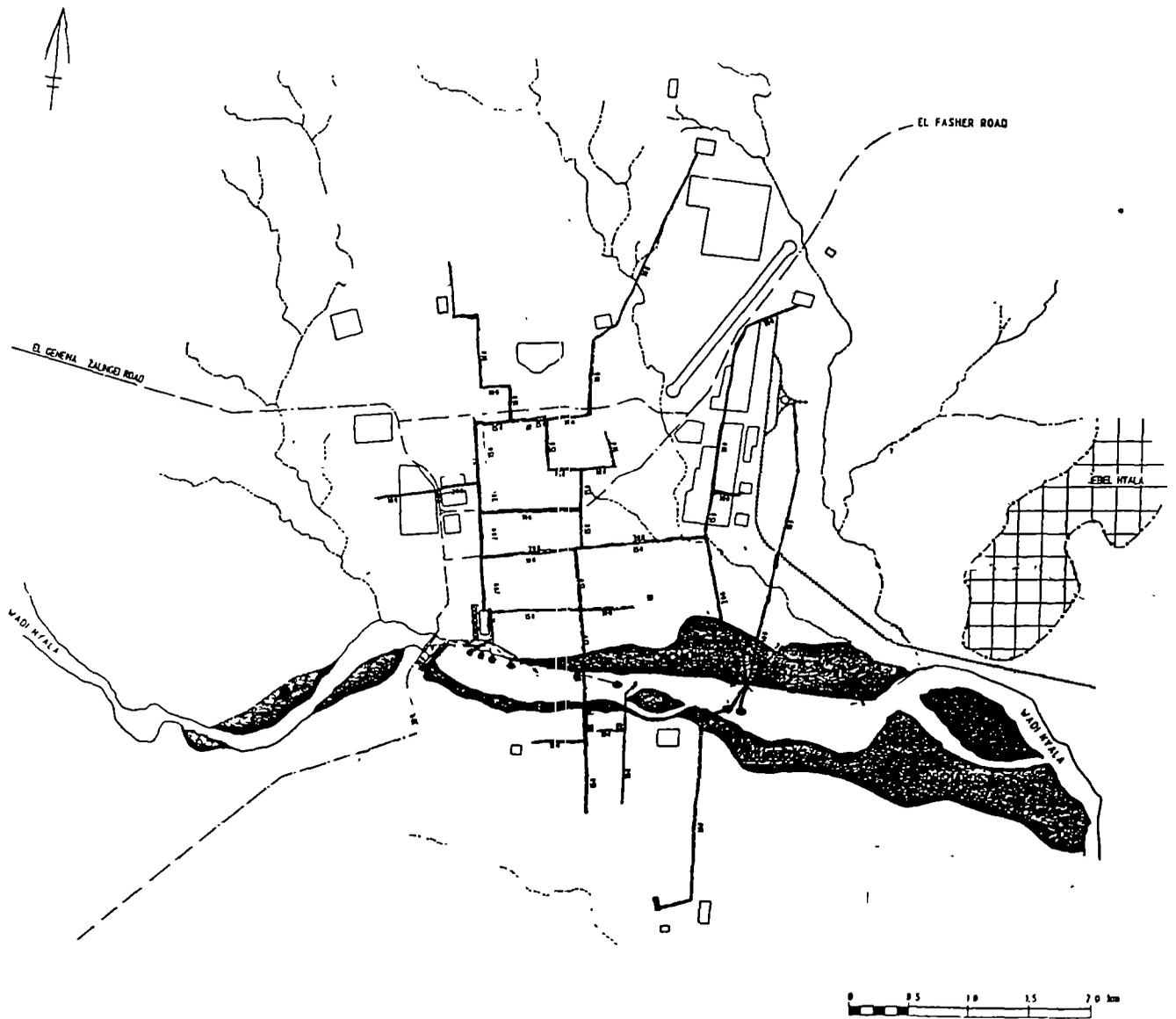
Nyala's source of drinking water

All water used for the piped water system in Nyala is groundwater taken from the wadi Nyala aquifer. Hydrogeological studies have shown that till the year 2000 the wadi aquifer contains enough water to supply the network. A weak point in taking water from the wadi bed is that heavy floods could cause serious damage to boreholes and power transmission poles.

The kiosks and house connections of the local water corporation used to get water from eight boreholes in the wadi Nyala. Pumping was done by electric submersible pumps. In order to balance supply and demand, five elevated tanks with a total volume of about 250 m³ were used at the NUWC compound. Five booster pumps in the pump house emptied the tanks and fed the distribution network.

Limited capacity of piped-water network

Currently there are between 5,000 and 6,000 households and numerous institutions connected to the network, which was designed and installed in the 1960s to supply 2,000 connections. Since then more connections have been made, and with limited investments in proper operation and maintenance there have been increasing numbers of breakdowns and leaks occurring throughout the system. Little information on the amount of water delivered was available, and nothing was known about water losses.



Map 2 *Nyala Water Supply System, 1986*

The same network delivered water to 22 concessionaire kiosks, of which eleven had been abandoned. Concessionaires rented the kiosks from NUWC as a private enterprise. They paid a small fee to NUWC for the rent and retained any profit. Considering the high prices charged, profits were substantial, and often NUWC received little revenue from these sources.

El Geneina's water sources Whereas the boreholes in the wadi Nyala are shallow (20 m), the boreholes in El Geneina are 50 to 60 m deep and are not located in the wadi, but on higher ground above the town.

At the start of the project water production in El Geneina took place at four locations.

- boreholes GP12 and GP06 at the NUWC water yard (Disa station), of which only GP12 was in operation;
- borehole 13 at the BH13 site, which was not equipped with a submersible pump - one has now been installed,
- boreholes 5 and 6 at the Kaja water yard, which were using very old reciprocating pumps;
- borehole 14 at the BH14 site, which was equipped with a damaged submersible pump which has now been replaced.

In Ardamatta, a settlement some 5 km to the north-east of El Geneina town, borehole GP02 was drilled but in operation.

Few El Geneina households receive piped water

The Kaja main pipeline supplied water to approximately 500 houses. Water delivery to these houses was very irregular. Sometimes people received water only a few hours a day, two or three days a week. In the past, some kiosks were in operation on the Kaja line but they had all been abandoned by the time the project started.

The Disa pipeline connected the Disa boreholes with the town's main from the Kaja wells. It provided water to the Town Council, the Sultans's quarters as well as several schools and students' boarding houses. There were many complaints about the poor performance on this line, due to continuous breakdowns of the pumps as well as lack of spare parts for the generator. Since the public power supply in El Geneina had not been developed, NUWC ran its own generators for pumping water. As diesel-fuel had to be trucked in from Nyala, power supply was often interrupted when the road could not be used during the rainy season.

Irregular fuel supply

The towns of Nyala and El Geneina regularly suffered from power cuts as a result of lack of fuel at the electricity companies. In Nyala, these cuts caused difficulties in keeping the pumps going. In El Geneina lack of fuel hampered the operation of the generators, which caused irregular pumping hours. Travelling long distances (e.g. between El Geneina and Nyala as well as to Khartoum) was sometimes impossible because of lack of fuel.

Darfur is isolated

As there is no paved road between Nyala and Khartoum/Port Sudan, transportation of materials such as cement, fuel and equipment from Khartoum or Port Sudan is a time-consuming activity. The railway connection is the best opportunity to transport goods, though sometimes wagons arrive with delays of up to one year, or do not arrive at all. Transport by lorry is difficult, especially during the rainy season, and even trains are delayed because parts of the railway are washed away.

The airline connection, which is predominantly used for transportation of people, is very irregular. Depending on the

season, the flight schedule varies from four up to seven times a week. In practice, however, sometimes only one plane a week is flying due to shortage of fuel, lack of spare parts or rains on unpaved runways.

During the rainy season, access to El Geneina is not possible because of impassable wadi crossings. Travelling to El Geneina is often hazardous as a result of tribal conflicts and banditry.

Difficult procurement

Procurement of materials is time-consuming, partly due to cumbersome customs clearance procedures. Making arrangements to clear materials which have arrived in Port Sudan needs continuous attention. Often, one of the local staff has to be sent to Khartoum to speed up the process. Even then, it can take months before materials reach their destination.

1.1 Need for Urban Water Supply

The spontaneous settlement of thousands of people from the surroundings confronted the towns with big problems. The new settlement areas were lacking public services such as water and electricity. Extending the existing water supply facilities was considered to be essential for attaining basic living conditions, health and hygiene. WSEP was created in order to provide the fringe population of the towns of Nyala and El Geneina with water in the short term.

1.2 National Urban Water Corporation

The chief water engineers of the local water corporations in Nyala and El Geneina are supervised by the state director of NUWC Darfur, who is stationed in El Fasher. Central responsibility for the performance of the different states rests with NUWC Headquarters in Khartoum.

NUWC Headquarters sets, among other things, the policy for tariffs, the appointment of engineers and the creation of new jobs. The local water corporations are therefore restricted in decision-making on local level. When vacancies have to be filled, approval from the state director is required. When new appointments have to be made or engineers are concerned, even Khartoum has to agree. Local management is not in a position to set tariffs or disconnection fees, even if local circumstances required this.

Ministry of Energy and Mining

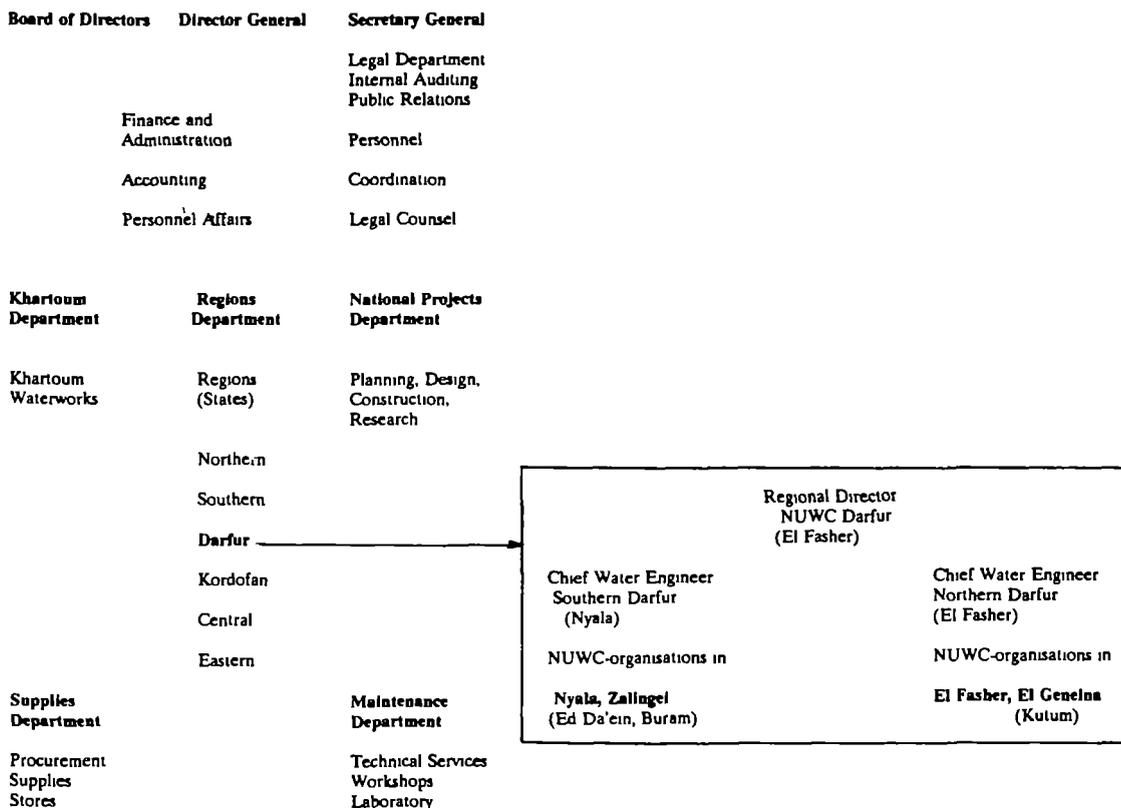


Figure 1 Organization Chart National Urban Water Corporation

1.3 Bottlenecks to Autonomous Growth

The staff of the local NUWCs in Nyala and El Geneina lacked the *supervisory* and *organizational skills* which are necessary for an efficient and proper implementation of project works, as well as for the operation and maintenance of the existing network. Without proper instructions and supervision from senior staff, project work could not be carried out satisfactorily.

Knowledge and skills of pipefitters, mechanics and electricians were also very limited. Standard procedures for carrying out major tasks such as preparing trenches, laying pipes and back filling were not known.

Because the revenue generated from services provided by the NUWCs in Nyala and El Geneina was insufficient to cover even recurrent costs, recourse had to be made to the federal-level NUWC for funds. Thus there was never any surplus

revenue to make improvements or extensions to the system. Now the federal Government expects the States to be less reliant on federal funds for the operation of basic services and so NUWC has to be more self-reliant in revenue generation.



Collecting the Water...



...from the Kiosk

2 PLANNING THE PROGRAMME

- Studies made in the past** In 1983, the British consultancy firm Howard Humphreys and Partners investigated the water supply situation in Nyala and El Geneina and made some recommendations, based on the available ground water resources, in order to improve the water supply in the towns. A significant additional study on water resources, WAPS-2¹, was performed by TNO-DGV. It was found that sufficient resources are available to make a significant extension on the existing system.
- Prospect of Dutch funding** In 1985, the recommendations were followed up by a Dutch mission which estimated the costs of constructing an extension to the existing piped water supply system, according to the proposals of Howard Humphreys, at Dfl. 34 1 million (Dutch guilders). Because this large amount could not be made available in the short term, it was decided to design a plan for a limited extension requiring a lower investment, as a first stage of a phased approach to the problem. A subsequent proposal by the WADS² Programme was the basis for the Water Supply Extension Project
- Water Supply Extension Project** In 1986, the Sudanese Government requested the Dutch Government to use part of the financial and technical assistance package offered, for structural improvements in western Sudan, to be used for improving the water supply capacity of the urban water installations in the Darfur towns of Nyala and El Geneina. An urban water infrastructure project should considerably increase the water supply capacity in the two towns and the project was going to be called *Water Supply Extension Project (WSEP)*. The conditions in which WSEP had to be implemented were not favourable in many ways. Although little attention was paid to this fact in the design phase, it is essential to mention some of these conditions here, in order to create a better understanding of the problems encountered later on.

2.1 Needs and Willingness to Pay for Water Services

- Most households in Nyala had to buy expensive water** Before any improvement programme is considered, a concise assessment must be made of the needs. In Nyala and El Geneina the influx of rural people, from near and far, had created an emergency situation. In Nyala the population had reached a level of about 300,000. About 5,000 house

¹ WAPS-2 = Nyala Water Resources Assessment Programme in the Sudan This programme was executed jointly by the National Rural Water Corporation and the TNO-DGV Institute of Applied Geoscience in the Netherlands

² WADS = Water Resources Assessment and Development Programme in the Sudan

connections in the central part of the town could provide 35,000 people with good quality water. The town also had 22 concessionaire kiosks, of which only eleven remained operational, selling water to neighbouring residents and water vendors. All other people had to buy water from water vendors who filled their carts from open wells along the wadi Nyala. The water vendors charged prices which were 10 to 20 times higher than NUWC's prices. Many families had to spend over half their income on water and those who could not had to draw water from dug wells themselves. Moreover, this water often came from contaminated wells and even when the vendors took their water from the NUWC piped water system, they often dropped the filling hoses on the ground soiling water which was originally clean.

Also in El Geneina

In El Geneina the situation was not much different; only about 500 families were connected to the piped water network. Alternative water resources were similar to those in Nyala, except that a larger part of the population lived closer to the wadi. At the onset of the rainy season, the wadi water is extremely dirty as run off water from the slopes carries much accumulated waste which causes a peak in the incidence of water-borne diseases.

More and cheaper water after extension of piped-water network

Although the needs assessment was rather rough, it was obvious that an extension of the piped water system could greatly improve the availability of good drinking water for households, at a much lower price than now offered by water vendors and of much better quality. The lower price not only allows families to use more water, it also leaves more cash left for food, shelter and clothing.

2.2 Organizations Involved in Development

Dutch Government assistance

Funding for imported equipment and materials, as well as for foreign consultancy services, was to be financed by the Dutch Government and channelled through its Directorate General for International Cooperation, and in the Sudan supervised by the Royal Netherlands Embassy.

Government of the Sudan and NUWC

The Government of the Sudan, through its relevant ministries, was to fund all local expenditures and provide, through the its National Urban Water Corporation (NUWC), the required counterpart staffing and local supervision.

Euroconsult

The Dutch consultancy firm, Euroconsult, had been selected to provide the planning and technical advisory services, the logistics for the import of all necessary materials and equipment, as well as the coordination between the Dutch and Sudanese authorities to ensure adequate progress.

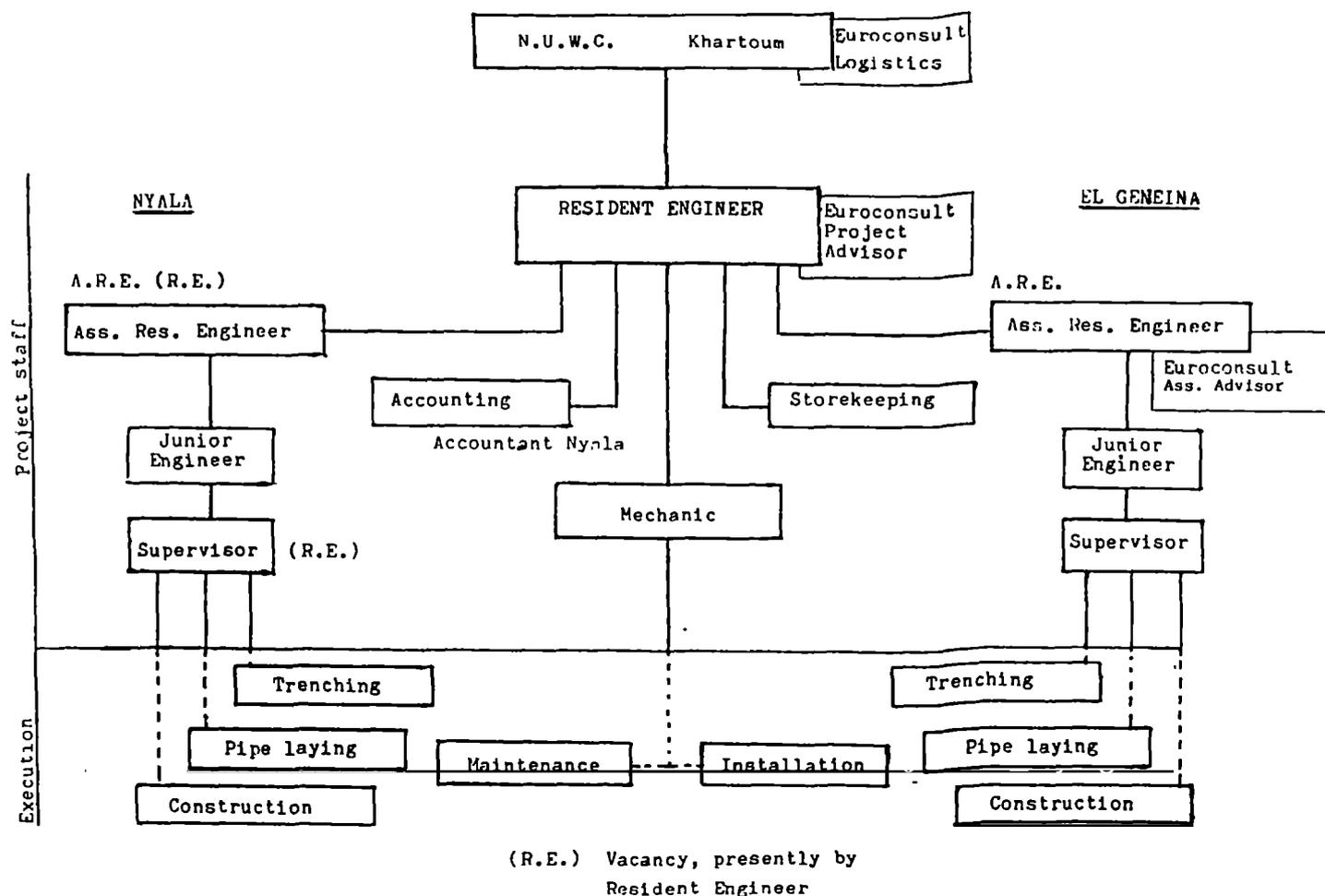


Figure 2 Project Staffing Nyala/El Geneina

2.3 Roles of the NUWC

NUWC operates the piped water supply systems

The water supply services in the towns of Nyala and El Geneina are provided by the local branches of NUWC, so extensions to the water supply systems would come under its operating responsibility. NUWC, through its National Projects Office, also became the national executing agency, responsible for providing the staff and supervisors for the actual execution of the construction works. Thus, the Sudanese contribution to the project would cover:

- transport and handling costs in the Sudan for materials arriving from abroad
- drilling of boreholes
- topographical surveys and geotechnical investigations
- construction of kiosks and small structures, and installation of electrical wiring and connections
- fuel and transport costs on the project sites

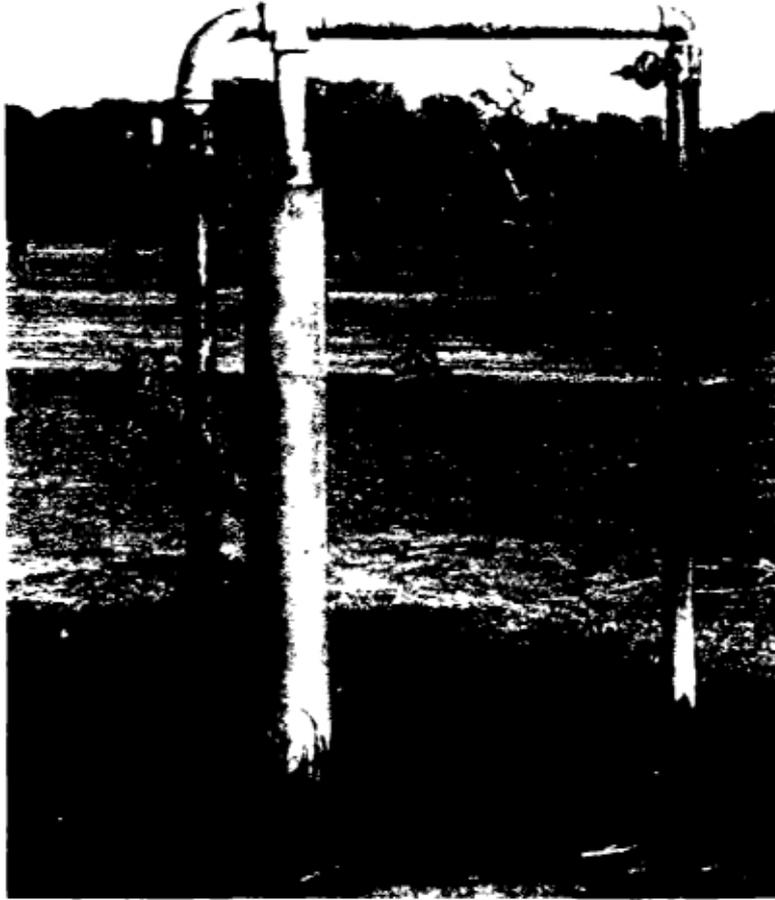
- all local labour costs
- costs of NUWC staff
- office accommodation and staff housing
- costs of services of other departments
- rent of equipment.

The National Projects Office would assume responsibility for the timely release of funds from the Ministry of Finance and Economic Planning.

2.4 Roles of the Consultant

More than technical advice Euroconsult as the selected consultant would make the planning, provide consultancies, deliver technical assistance and give local support to NUWC. Moreover, it would plan and coordinate the timely delivery of:

- pipe materials and fittings for the kiosk distribution network
- submersible pumps
- electro-generators for El Geneina and Ardamatta
- electrical wiring
- pipe-laying and cutting tools
- radio equipment
- vehicles.



The Delivery Pipe from the Submersible Pump ..

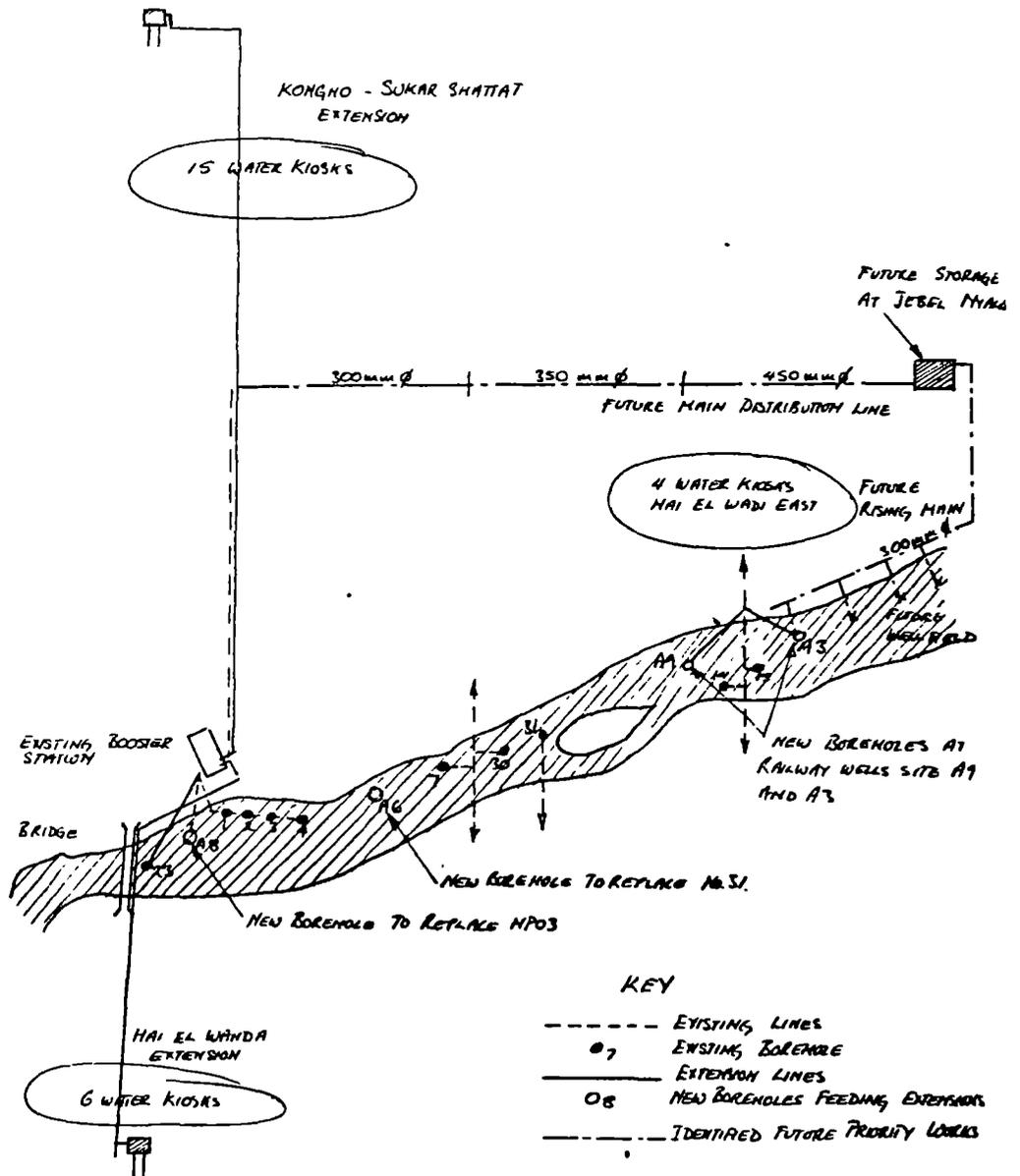


...to the Kiosks

3 INFRASTRUCTURAL DEVELOPMENT

3.1 Objectives

In October 1986, the WSEP carried out a feasibility study on the basis of Howard Humphreys' proposals. Surveys were undertaken concerning population, demand for water, per capita consumption, topography and available water resources. It was decided that during Phase I kiosk extensions would be made to the fringe settlements in the northern and southern parts of Nyala, in El Geneina and in Ardamatta.



Map 3 *Planned Construction Works Nyala, Phase I*

First steps for Nyala

Objectives for Nyala:

- four new boreholes with submersible pumps in the wadi Nyala
- an extension to hai El Wahda and construction of five kiosks
- an extension to the hais El Sukkar Shattat and El Kongor and constructions of 16 kiosks
- construction of two elevated tanks in Sukar Shattat and one in Wahda
- installing of new higher capacities booster pumps for the pump house.

Choice for direct pumping

Howard Humphreys had proposed to construct a high-level reservoir at Jebel Nyala. This reservoir would store the output of the new boreholes in the eastern well field. An alternative was direct pumping from the boreholes into the network. Although the first option would be more efficient, the project decided on the last option because not enough funds for the construction of a new reservoir were available

Parallel higher pressure network

During site visits and discussions with the water corporation in Nyala, it became clear that the proposed kiosk extensions would require a higher water pressure than the existing network could support. Thus it was decided to lay new pipelines parallel to existing ones.

First steps for El Geneina

For El Geneina the objectives were:

- two new boreholes with pumps in Ardamatta
- a new pump in borehole GP06 and connection of this borehole to the Disa water yard
- a new pump and generator for borehole BH13
- a pipeline from BH13 to supply ten kiosks
- a pipeline from BH14 to the town
- replacement of the 100 mm asbestos cement pipeline from the Disa water yard to the town by one of 150 and 200 mm ductile iron
- new network in Ardamatta for eight kiosks
- elevated tanks at BH13 (one) and Ardamatta (two).

Plans for the second phase

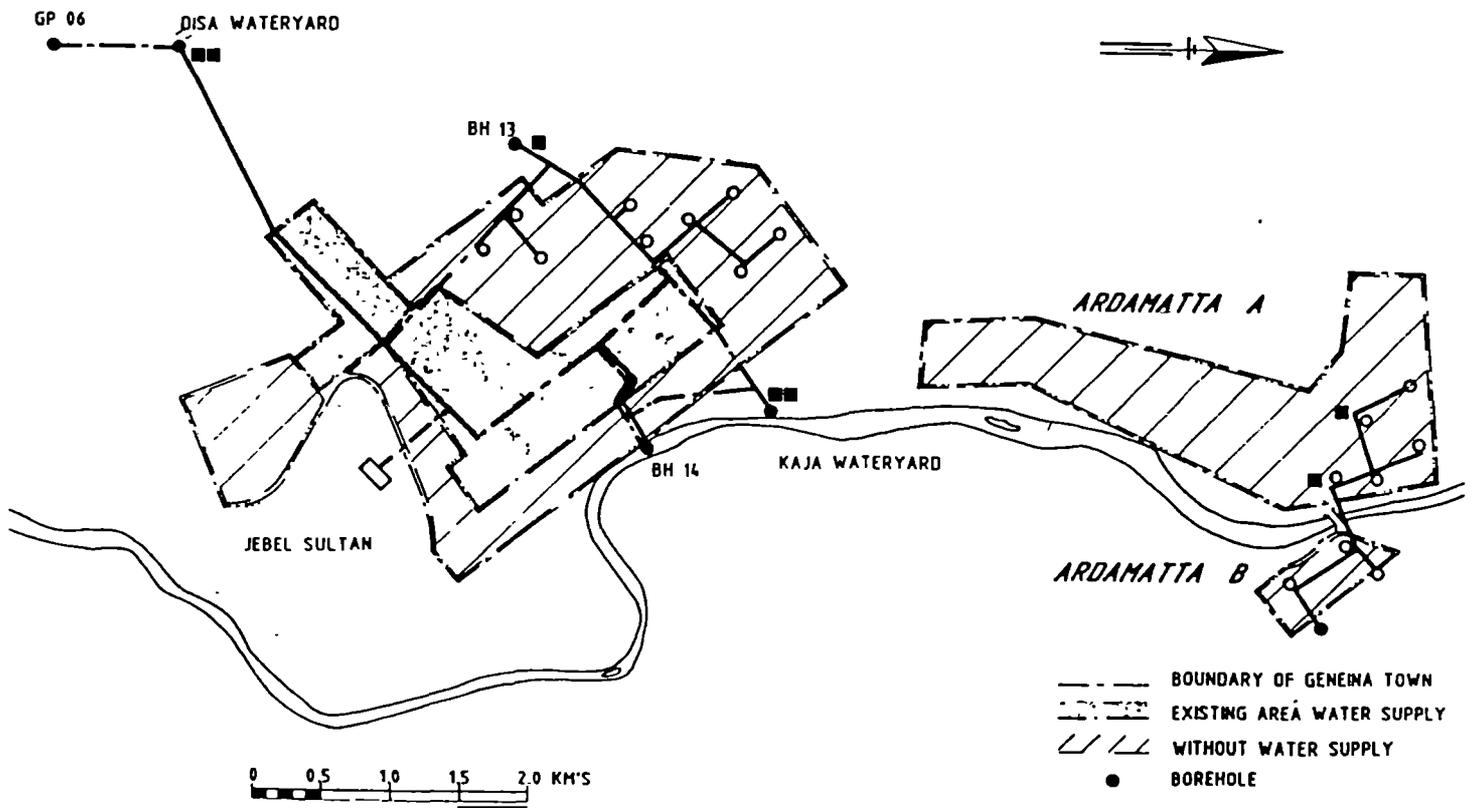
A draft project proposal for Phase II was approved by the Sudanese and the Dutch Government during their mid-term consultations of July 1987. A technical review was carried out in the period October-December 1987 to elaborate the preliminary designs.

The activities to be carried out by the improvement programme were:

For both El Geneina and Nyala:

- essential repairs of badly leaking sections of the existing distribution system and mains
- replacement of gate valves in existing distribution system

GENEINA TOWN



Map 4 Planned Construction Works El Geneina, Phase I

- installation of non-return valves on all new operating boreholes
- installation of (bulk) water meters
- fitting of float valves on elevated tanks
- technical training of local NUWC staff on:
 - *operation and maintenance* of borehole and booster pumps, electrical switch gear and wiring
 - *reconditioning, operation and maintenance* of electro-generators (El Geneina)
 - *pipe-laying, fitting, and valve and water meter installation.*

For Nyala only:

- replacement of four submersible pumps in existing boreholes
- rehabilitation of piping, electrical circuitry and switch-gear in booster pump station Nyala.

For El Geneina only:

- replacement of the pipeline from GP06 to the Disa wells site
- replacement of Kaja main
- rehabilitation of two Disa boreholes
- transfer of the submersible pump from BH13 to GP06 and installation of a new pump in BH13
- installation of new pumps in BH12, Kaja and Ardamatta
- refitting of electro-generator at Disa and installation of generators at BH13 and BH14
- repair of Disa and Kaja elevated tanks
- connection of the hospital tank to the BH14 line

3.2 Choice of Technology

The system of kiosk extensions in Nyala is fairly simple. Water from the boreholes is pumped into storage tanks which are connected with the pump house. From the pump house, booster pumps provide extra pressure to reach the kiosks.

Kiosk design

The original kiosk design was of concrete construction and this design has been used in hai El Sukar Shattat and hai El Wahda in Nyala (21 kiosks) and in El Geneina (10 kiosks)

Extensive use of ductile iron pipe

For the kiosk extensions ductile iron pipes were imported from the Netherlands. Ductile iron was chosen because the material is strong and very durable. The pipes for the main pipeline to hai El Wahda have a diameter of 100 mm, those for hai El Sukar Shattat/Konghor 200, 150 and 100 mm. 50 mm pipes were laid to connect the kiosks to the main pipeline.

Meters for kiosks

All kiosks were to be supplied with a water meter and a non-return valve. The "Kent" design of water meters was selected as these only measure the water that is pumped and not the air that sometimes is pushed through the pipes thus giving more accurate readings. Meters and valves were mounted in chambers to prevent misuse or damage.

Submersible pumps

For a shallow aquifer like that of the wadi Nyala, Grundfos submersible pumps proved to be the most suitable.

Booster pumps

For the pump house, booster pumps of the brands Grundfos and Stork have been installed. Grundfos and Stork booster pumps were installed in the pump house.

Elevated tanks

Glass reinforced polyester elevated tanks have been erected with water-level indicators and float-valves to prevent wastage from overflows.

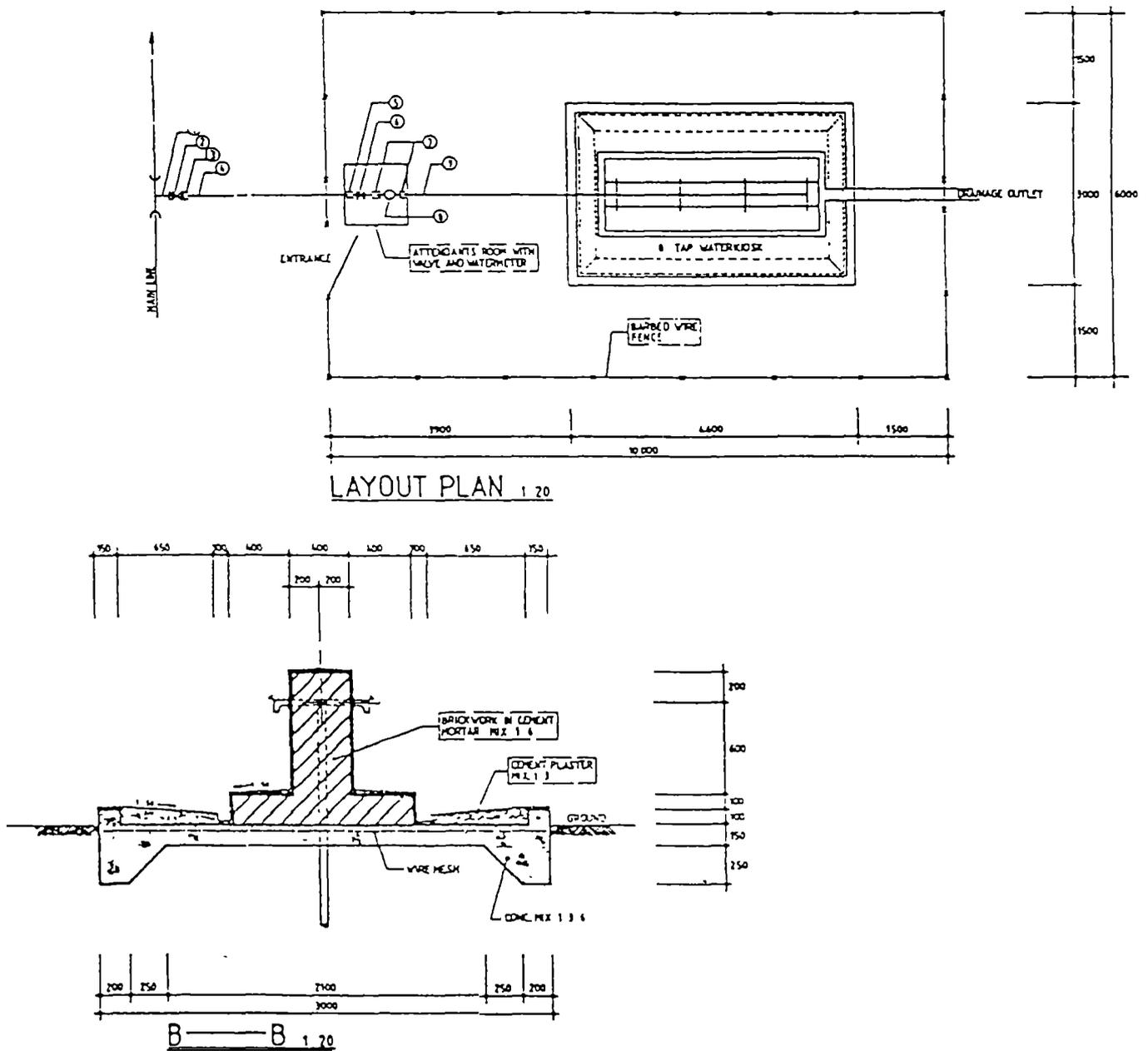


Figure 3 Design of Phase I Kiosk

Plans for the third phase

Research carried out by WADS had shown that it would be possible to extract considerable amounts of water from the eastern part of the wadi Nyala. Therefore it was decided that in Phase III of the WSEP, five new boreholes would be drilled in this area. These boreholes could increase the water supply to the town network and at the same time could supply new kiosk extensions in the eastern and western parts of Nyala.

In El Geneina, a kiosk extension to the area of Ummdein was planned as this part of the town did not have any piped water supply services.

Later adaptations on kiosk design

Some adaptations were made on the original kiosk design for a more convenient use. The new design required less cement. Kiosks using the revised design were constructed in Ardamatta and later in hai El Wahda (rehabilitated kiosks). For the 22 kiosks in hai El Taiba, Jebel and Geer the same design was used.

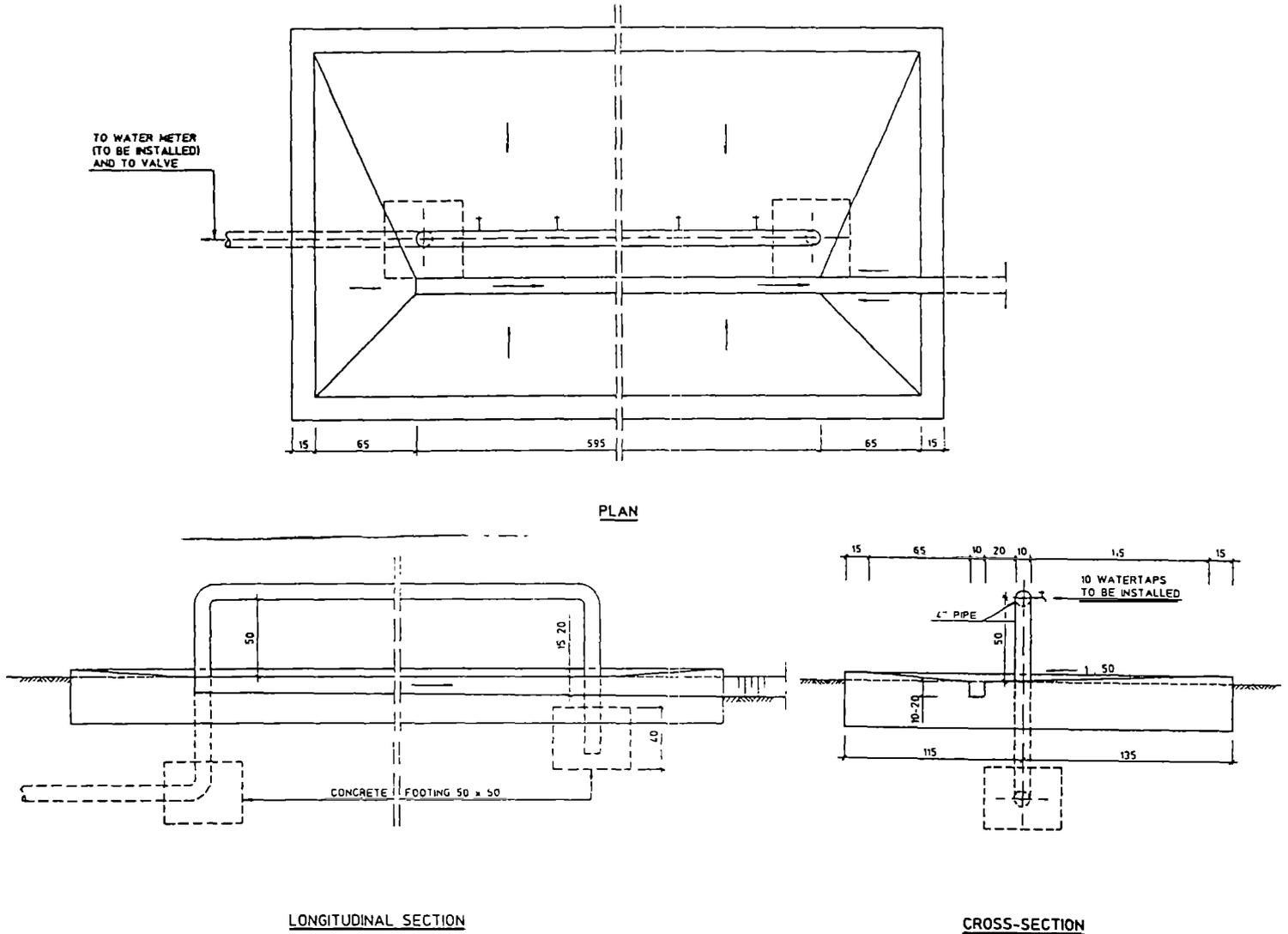


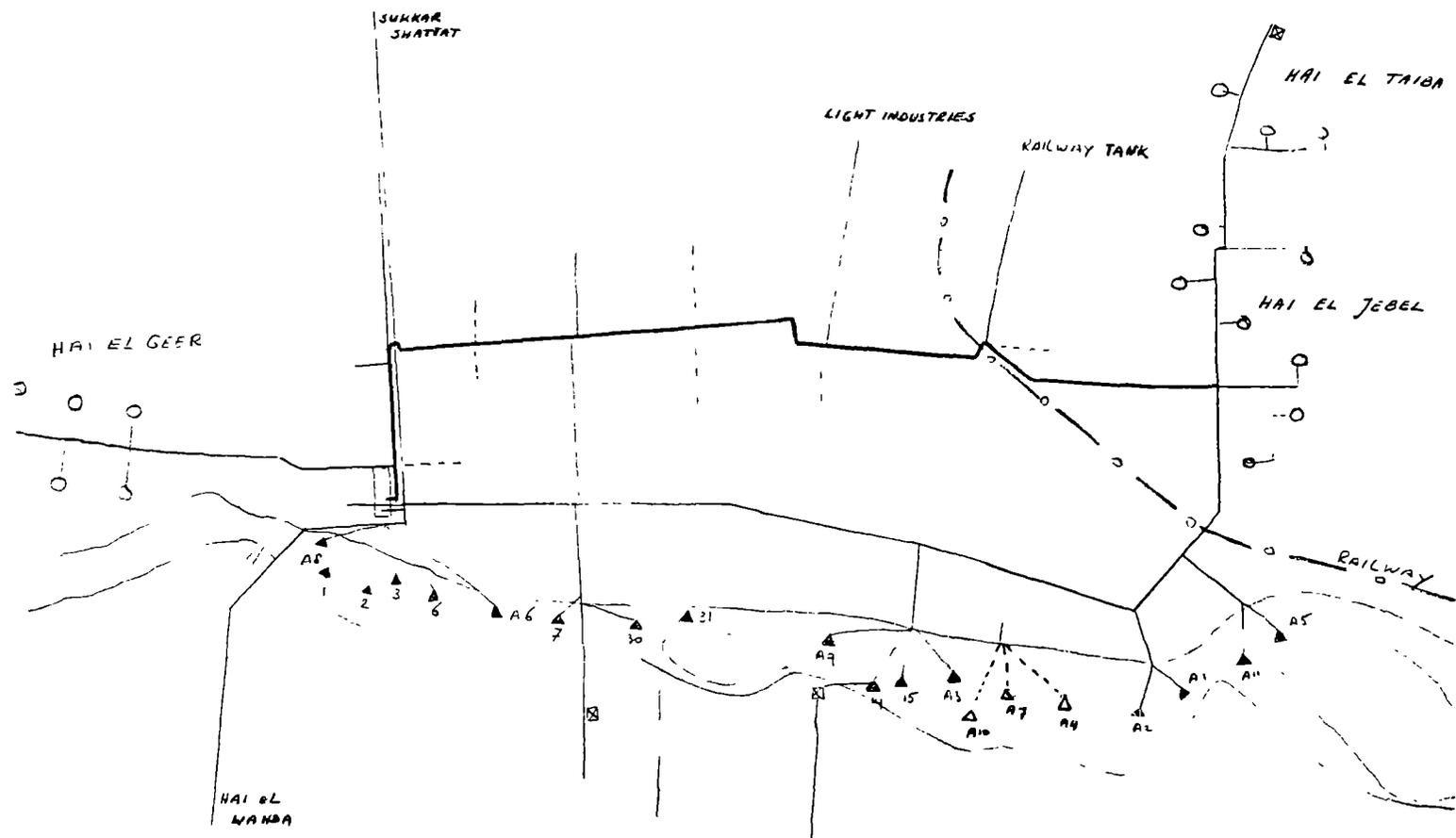
Figure 4 Design of Phase II and III Kiosks

High and low pressure booster pumps

To improve the existing pumping equipment and the operating conditions, a mission was undertaken in May-June 1989 which made recommendations for Phase III. The mission stressed the consequences of connecting the existing

distribution network of Nyala with the new lines constructed. Any such connection would mean that the high supply pressure for the newly constructed pipelines would also apply to the existing old distribution network. With the low supply pressure in the existing network, there were already many leakages and fairly frequent pipe bursts.

To solve this problem, two different kinds of booster pumps were to be installed: one for the high pressure zone and one for the low pressure zone. An extra ground-level storage tank was necessary to balance out the water demand against the constant rate pumping from the boreholes.



Map 5 *Planned Works Nyala, Phase III*

Objectives for the third phase

Nyala:

- five new boreholes
- storage tank of 800 m³ at the existing pump house site (instead of reservoir on Jebel Nyala)
- ring line between pump house, the new storage tank, hai El Taiba/Jebel and boreholes in the eastern part of the wadi
- extension to hai El Jebel/Taiba with 15 kiosks
- extension to hai El Geer with seven kiosks.

The upgrading of the water supply in Nyala north was added in 1992. This was considered to be urgent as the water pressure in this area was very low (especially during the dry season), due to many new connections that were added to the network. It was proposed to make a high pressure pipeline to the northern part of Nyala and to replace the pipelines in the area with bigger ones.

El Geneina:

- four new boreholes at the BH13 station and one near Ummduein
- storage tank at BH13 site of 276 m³ capacity
- pipeline connections between the different mains to create a looped distribution system, carrying part of the output of GP06 and GP013 to the new reservoir at BH13
- kiosk network in Ummduein.

3.3 Planning of the Implementation

Implementation in three phases

During the mid-term bilateral consultation of June 1986, the Dutch Government agreed to provide technical assistance and financial support for the first phase of WSEP. Responsibility for implementing the Project was given to the NUWC. The project would be carried out under supervision of a NUWC Resident Engineer. The consultancy firm Euroconsult from the Netherlands was selected to provide technical assistance and logistic support. The project itself was to carry out further investigations and add details to make a final design within the overall design concept of Howard Humphreys.

In December 1986, during their bilateral consultation, the Sudanese and the Dutch Government agreed that the project should continue into a Phase II, in order to consolidate the progress made in Phase I. Later on, an institutional strengthening project (also indicated in the Humphreys Howard report) should be implemented to ensure sustainability of the developments.

At the start of the project in September 1986, it was estimated that the works could be completed in July 1987.

Very soon it became clear that the implementation of the works would need much more time. Trenching for pipelines could only start in February 1987. In September 1987, one year after the start of the project, only 50% of the trenching was completed. Therefore, an extension for Phase I was given to complete the works in July 1988. In July 1988 this phase of the project was extended for another three months.

The third phase of WSEP started in January 1990 and was to be finished in December 1991. As the project works were not

yet completed by this date, Phase III of the WSEP was integrated in the Institutional Strengthening and Management Development Project (ISMDP)³, from January 1992.

3.4 National Projects Office

Regulations for national projects

The WSEP for Nyala and El Geneina was carried out by the National Projects Office of the NUWC, with the assistance of the local water corporations in Nyala and El Geneina.

Special regulations apply for carrying out national projects, such the WSEP. These regulations, set by the Ministry of Finance and Planning, limit:

1. release of funds: NUWC Headquarters cannot release new funds before previous expenditures are approved;
2. expenditures above £S 10,000 (Sudanese pounds);
3. purchase of goods and payment of casual labourers against market prices.

Ad 1.

With four different departments within the Ministry of Finance and Planning required to approve the release of funds to the local level, releases were often delayed. Often when funds were finally released, their value had decreased considerably due to inflation and on occasions funds were diverted for other purposes.

Ad 2.

Another limiting factor to progress is that for expenditures above a certain amount, consent from the state director in El Fasher is required, and when large amounts and tenders are concerned additional permission from Khartoum is required. Although these rules are intended to control expenditure, in practice it means that there are major delays every time a request is made and thus progress at local level is delayed.

Ad 3:

Certain goods, such as cement, may only be purchased at the official price, fixed by the Ministry of Finance. Therefore some goods cannot be bought from the local market and have to be sent from Khartoum. The Government sets wage rates for casual labourers who are contracted for construction, trenching and pipe-laying activities and because wages in the open market are much higher, labourers are often not willing to work for the water corporation.

³ The ISMDP had started in Nyala in 1989, to strengthen the local water corporation in its operation, maintenance and (financial) management

Constraints slowing down implementation

All this, and a weak infrastructure (roads and communication), time-consuming procurement procedures and unfavourable economic conditions (rapid inflation, shortages of fuel and materials) led one to conclude, even before project start-up, that serious constraints would have to be dealt with during implementation.



Wadi Nyala, and New Storage Tank in the Background



Paying Bills/Collecting Revenue

4 INSTITUTIONAL DEVELOPMENT

Very soon after the start of the WSEP project, it became apparent that technical improvements were insufficient if these improvements were to be of lasting benefit to the population of Nyala and El Geneina. In 1988, a Dutch mid-term review mission recorded the poor performance of NUWC Nyala particularly in operations and maintenance. The mission concluded that:

- training of personnel required improvement;
- key positions in the organization needed to be filled;
- maintenance needed improvement;
- a higher fee collection rate was required in order to meet operation and maintenance costs.

Pilot project

It was recommended that a study should be made by the consultant, concerning the institutional aspects of NUWC Nyala. On the basis of this study, a "pilot project" would be carried out, as a part of the special status projects, which were designed to develop a methodology which could be applied in other towns in the Sudan⁴.

A "pilot project" status would allow some freedom in the field of "tariff-setting" (e.g. introduce water fees based on cost recovery). The Dutch Government could give support with respect to training, organization development, revenue collection and community participation

Study for institution building

During September-October 1988, the consultant carried out a study in which the needs and requirements for institution building of the urban water corporations were investigated, and recommendations for implementation were made.

Strengthening existing functions and developing new ones

One year after the start of ISMD, a second review mission of the Dutch Government suggested that NUWC Nyala should become a Water Supply Company. By strengthening already existing functions, such as production, distribution, revenue collection, operations and maintenance, and developing new functions such as design, planning and construction, consumer relations, staff development and training, the corporation was to become self-supporting. The establishment of such a public enterprise was considered to be necessary if the aims set by the pilot project were to be achieved. The mission also recommended to accelerate the integration of the technical project (WSEP) and the organizational project (ISMDP).

⁴ According to the Task Force for the planning and management capacity in the water and sanitation section, established by the Ministry of Finance and Economic Planning

A four-year project

During the bilateral talks between the Sudanese and the Dutch Government of mid 1991, agreement was reached for continued funding for the Project to the end of 1993 or possibly the end of 1994

An amount of Dfl 2 5 million was reserved for the project by the Dutch Government, of which Dfl. 686,000 would be used for the first year.

As the integration of the pilot project with the activities of the WSEP III became increasingly important, some components of the WSEP budget could be utilized and managed by the pilot project, in particular that for training.

4.1 Objectives

Towards reliable and sustainable water supply

The general objective of ISMDP was to ensure smooth operations and proper maintenance, so as to safeguard reliable and sustainable water supply. This was to be achieved through:

Objectives of ISMDP

1. Improvement of water management and health conditions:
 - install user committees with members of the population living near the kiosks who will look after the operation, use and hygienic conditions of the tap stands;
 - support other organizations in activities to promote hygiene education and sanitation;
 - encourage the installation and use of low-cost sanitary facilities and provide technical assistance to the health authorities.
2. Organizational strengthening of the local NUWC:

Human resources

- clearer designation of functions and tasks (job descriptions, job titles, career development, appraisal of job performances, selection requirements, transfers, assessment of training needs);
- review of the remuneration packages of all staff and personnel; reassessment of allowances (e.g. overtime); proposals for incentives;
- upgrading skills of supervisory staff;
- improved communication between management, supervisory staff and work force.

Operations and maintenance

- improved scheduling of operation and maintenance work;
- more regular inspection of operating equipment with appropriate follow-up (based upon the suppliers technical specifications and timetables).

Supply and storage of materials

- provision of equipment, tools and supplies (office and administration, workshop, transport);
- supply of tanks for bulk storage of fuel;
- installation of radio equipment;
- more local tendering for procurements of equipment and spare parts should be allowed;
- introduction of simplified stock control and issuing procedures to improve stock management.

Financial management

- improved financial management and revenue collection to cover recurrent costs;
- socio-economic study of affordability of water tariffs;
- review of tariffs for private connections;
- placing bulk meters;
- detailed review of all outstanding water bills;
- assisting administration and accounting sections in the development of appropriate procedures (for preparation of water bills, account administration, revenue collection) and in the processing of data into consolidated revenue/expenditure statements and balance sheets;
- assist the timely preparation of the annual budget submission with provisions for cost inflation and budget adaptation for real requirements;
- retain collected revenues in a local bank account to cover costs for operation and maintenance, under the obligation to submit regular "statements of revenue and expenditure" to Darfur and Khartoum.

Immediate aims for the first phase of ISMDP

The first phase of the Pilot Project was coordinated by a consultant, who in the second year was assisted by an Assistant Project Advisor, stationed in El Geneina. The immediate aims of the project were:

- improving revenue collection;
- improving methods for operations (operating schedules and procedures, bilingual manuals, more efficient distribution of water, adapted pumping schedules);
- improving maintenance (more active and effective leak detection);
- collecting management data including water flow monitoring;
- upgrading accounts sections;
- facilitating training courses (technical, administrative/ accounting, overseas);
- establishing a planning unit;
- establishing user committees for kiosk management;
- rehabilitating old kiosks and bringing them under NUWC management;
- identifying unregistered private connections;

- developing better methods of revenue collection for tanker filling;
- renovating Nyala pump house and equipment;
- executing a Health Education Support Programme (HESP).

The first mid-term Review Mission of 1990 approved an extension of Phase I until January 1992.

4.2 Water Costs and Cost Coverage

Water resources for NUWC Nyala

All water produced by NUWC Nyala is pumped from the wadi Nyala aquifer. This aquifer extends from the surface to about 20 m depth. It is more than 100 m wide and about 5 km long. It crosses the town just south of the centre. Twelve boreholes can be used but, in 1993, only ten were equipped with a pump. The boreholes are quite evenly distributed over the full length of the aquifer and all those belonging to NUWC are connected to the pipeline network and to the electrical grid. In general and during most of the year, the water is of such quality that it does not need to be treated. At the onset of the rainy season, care should be taken that water, contaminated by dirt on the surface, is not immediately pumped back up again. This can occur when boreholes have run dry during the previous dry season and water filters too rapidly to the submersible pump area.

Energy costs

As pumping depths are low and horizontal pumping distances are moderate, the running costs for Nyala are rather low. All pumps in Nyala are powered by electricity which is generated by the National Electricity Corporation (NEC). During 1993 the total energy costs for pumping are estimated to be about £S 300,000 per month. NEC does not bill NUWC, neither does NUWC charge NEC for water.

O&M and staff costs

Over the first ten months of 1993, the operation and maintenance costs were £S 280,000 per month, while staff costs were £S 1.2 million on a monthly basis. At the moment, only staff costs and O&M costs are considered as production costs.

Pump replacement is an important part of water costs

During the lifetime of WSEP, many pumps have been imported and paid for by the project. In most years, about three pumps had to be replaced. Based on 1993 prices, this would represent about £S 400,000/month. All above-mentioned costs are actual costs and NUWC will soon be confronted with having to pay them. All costs together amount to £S 2,180,000/month, while on average only £S 1,920,000/month has been generated in 1993.

Government institutions pay only about 20% of their dues

Nyala NUWC has shown an operating surplus in 1993 only due to the fact that NEC did not bill for the delivered power and because NUWC could still draw on a donated stock of pumps. Fortunately, the actual costs and revenues are not far apart and, as monthly billings to water consumers could amount to £S 4 million, a slight improvement in revenue collection will create an actual operating surplus. Government institutions pay only about 20% of their dues and add £S 1,6 million to their arrears every month.

The real cost per cubic meter of water for the first ten months of 1993 can be determined as follows:

- Staff costs	£S 1,200,000
- Operations/maintenance	280,000
- Pump replacements	400,000
- Electricity	300,000
- Total monthly costs	<u>£S 2,180,000</u>
- Water production/month	m ³ 187,000
- Water delivered (20% loss)	m ³ 150,000
- Cost per m ³ delivered	£S 14.5

4.3 The "Water Process"

In towns like Nyala and El Geneina, all activities related to water production and distribution can be called the *water process*, all work related to revenue collection and payments, can be called the *money process*, and other activities the *supporting services*.

It is important to recognize these as processes, as the sections involved in these processes are strictly dependent on work which is done by the section before them. Obviously, water cannot be distributed before it is produced and customer bills cannot be prepared before meters are read.

All staff should be aware that progress in their work, or lack thereof, has a critical impact on that of others. The *water process* takes place in the *production and distribution department* headed by the *water engineer*, who is directly responsible for the interaction of all the sections involved. All the section chiefs of this department report directly to the water engineer.

Operations	In Nyala, water is produced from about twelve boreholes located in wadi Nyala. All these boreholes are (can be) equipped with electrical submersible pumps and, because of this, have electrical wiring and controls and are connected to the pipeline to the network. The control equipment is placed in a control room located near to the boreholes. An operator and a watchman are constantly present to activate the equipment and check on its functioning. All pump operators work in the <i>operations section</i> .
Maintenance	In case of abnormalities, the head of the pump house is alerted, who can send an electrical or mechanical repair team. Electrical and mechanical maintenance is provided by the <i>maintenance section</i> . The electricians of the maintenance section also install the wiring for new boreholes while the mechanical section (assisted by the <i>pipeline repair section</i>) installs pumps and lays new pipelines.
Pipelines	The <i>pipeline repair section</i> is responsible for the upkeep and repair of the production and distribution pipeline system. The section is also responsible for surveying new connection locations and making new consumer connections. These two activities are not directly related to the ongoing water process.
Meter mechanical and inspection	The <i>meter mechanical and inspection section</i> inspects, tests and repairs water meters. This section also makes the disconnections and reconnections at the consumers' locations, according to instructions prepared by the <i>consumer accounts section</i> of the <i>accounts department</i> . A disconnecter and a reconector always visit the town areas together with an inspector, who assists in difficult situations and inspects the neighbouring houses for meter functioning, unregistered and illegal connections. This disconnection and reconnection activity involves one of the very few interrelations between the water and the money process.

4.4 The Money Process

Meter reading	Once the water has been delivered to the customer, the customer has to be charged. The first step involves consumer-meter reading, which is performed by the <i>meter reading section</i> . All meters are to be read monthly and water consumption is registered in the consumer accounts books.
Consumer accounts	On the basis of water consumption data, the <i>consumer accounts section</i> prepares the billings. Bills are sent out to large customers and household consumers visit the consumer accounts section first, to get the information on the amount due.

Treasury Hereafter they pay at the cashier's office (*treasury section*). The cashier also has to pay out the wages and salaries according to statements prepared by the *general accounts section*. The treasury section keeps records of all cash movements by category. The section makes daily, weekly and monthly income statements for management.

General accounts The *general accounts section* is responsible for the general accounts system. In May 1993, NUWC Nyala has started to work with the commercial double-entry accounting system. The books of prime entry of this system strongly resemble the books previously used in the Sudan. These books of prime entry and salary and wages statements were then summarized for reporting to the *state director's office*. The information processed in this way leaves little possibility for generating management information. From the newly introduced commercial double-entry system, it is quite easy to provide a series of management reports (see NUWC/ISMDP/ Euroconsult report of the financial and accounting specialist, October 1992).

4.5 The Supporting Services

Administration and personnel The sections of the *supporting services department* serve all other sections of the water corporation.

The *administration and personnel section* performs all administrative, logistic and legal steps in the hiring, promotion, remuneration, reprimanding, sanctioning, retirement and laying-off processes of the staff. It has to keep personnel and retiree records up-to-date, as well as to monitor the personnel establishment and propose new hirings, promotions and transfers and advise management on this.

The more specific administrative functions are to prepare period allowance statements, and to prepare, type and file all correspondence. It assists with, registers and guides the new customer application process. The section also supplies the services of the executive office manager who assists management with section report collection, filing, analysis and processing, as preparation for consultation and meetings.

Purchasing and stores The *purchasing and stores section* has the task of supplying NUWC Nyala, in a timely manner and at reasonable cost, with the necessary goods, of adequate quality, for the execution of the corporation's tasks. It is to provide the corporation with information on availability, purchasing conditions and prices of these goods. The section stores the goods, which are not immediately put in use, in a well organized safe location for direct retrieval on authorized

demand. At the same time it has to keep adequate records of the stored goods and their distribution, and of the history of previous acquisitions and their supply conditions.

Transport

The drivers of the *transport section* provides transportation on approved request. They check normal functioning of the vehicles and report abnormalities through the chief driver to the garage. Every day before taking off, they inspect, clean and maintain the vehicle according to established guidelines. The technicians in the garage of the *transport section* perform scheduled inspection and maintenance on all NUWC's vehicles and when necessary replace defective parts.

Guards and messengers

The guards of the *section general* check on all people and goods movements to and from water corporation premises according to clearly set instructions. They report all abnormalities to designated staff or police. The guard service also issues water to tankers at tanker filling points against a delivery voucher. The messengers of the *section general* assist corporation staff by transmitting messages and goods.

4.6 Work-load and Manpower

Nyala's 200 NUWC employees serve only about 6,000 water taps, while there is still much room for improvement of the water service. This ratio of 30 taps per employee is low by any standard and points to a low *efficiency*. The fact that the service level still leaves much to be desired, tells us something about the *effectiveness* of the water corporation at this level of technology.

Description of the sections

ISMDP has taken a closer look at the tasks of each section of the Nyala water corporation, and has established, in cooperation with the section chiefs, a list of task descriptions. This has been done at the section level, as sections perform only one or a few unique tasks each. A rather short description outline for all sections has been made; this is presented in Annex A.

Four hierarchical levels

Each section has a chief who is responsible for all activities and staff of the section, and who reports to the head of department. It appeared that in Nyala all staff of the sections report directly to the section chief. Although one finds many ranks within a section and, work team leaders may be placed between a staff member and the section chief, this does not create an official layer in the hierarchy. It follows that one finds only four hierarchical layers, which is just right for this type and size of organization.

Delegation of authority	Management, together with the section chiefs, should discuss what authority is to be delegated to the section chiefs. Once agreed, management should respect this delegated authority and not act in place of the section chief or head of department. In the past, section chiefs complained a great deal about their lack of authority. Now they know that they can ask for a declaration of authority, which ideally should be put in writing and officially filed.
Instructions in writing	Management in Nyala has also been advised to put all orders and instructions in writing, with one copy to the party concerned and another in an official file. Most instructions are given during meetings and it should be the primary task of the executive office manager (or any other person assigned for taking notes) to prepare a typed statement of the instruction.
Section reporting forms	During 1993 most of the staff have become more aware of their responsibilities and reporting lines are now well established. The introduction of a system of periodic <i>section reporting</i> has helped a great deal in this respect. The section description outlines have been discussed with each of the section chiefs and, in September, when the new chief water engineer took office, these were officially accepted.
Vacancies on management level	The reporting line (from staff member, section chief, department head to chief water engineer) is now generally followed. It is regrettable that department head positions are too often vacant with a section chief who is often junior and less experienced taking responsibility.
Work-load	Using the section task descriptions, the work-load of each section can be calculated. Staffing levels of certain sections, operations and general sections, is based upon the pumping hours and overall operational levels of these sections. Often consideration is given, when calculating staffing levels, to the social context and the previous "customs and practise" and thus there is often considerable overstaffing. Management has to be able to seek opportunities for reducing staffing levels, even for a limited period. For certain tasks, such as meter reading and consumer accounting, standard work-load norms already exist within the NUWC.
Estimating the required work-force	The staffing level of other sections mainly depends on the quantity of work to be done. Until recently management had very little idea how much work needed to be done and how many workers were required for it. Now task descriptions for all sections have been made and methodologies have been developed on how to estimate the required work-force, once the amount of work is known from the periodic section reports.

Backlogs in work	Several sections, though not clearly understaffed, regularly show enormous backlogs in their work. Affected sections should report weekly on the status of this backlog and, in cooperation with higher management, immediate action must be taken to eliminate the backlog. Management should then closely supervise this section so the same does not reoccur. If it happens regularly because of absence of staff, staff from less busy sections could be trained to temporarily replace the absent staff.
More staff than necessary	The section descriptions, including work-load analysis, have for practical reasons only been carried out in Nyala but the same format can be used in any town. The analysis clearly revealed that, with little or no reorganization, about one-third of the staff can be reassigned to other tasks. This means that the costs for labour are currently about 50% higher than necessary. Improvements in efficiency can be made by finding other work for these employees. In case of a vacancy, the regularly updated <i>employee evaluation forms</i> are essential to locate the most appropriate internal candidate. All vacancies, except the top management levels, should be filled from inside the corporation
How overtime allowance is used	Besides a series of regular additions to the salaries, such as uniform allowance, travel allowance, etc., only overtime allowance is officially related to performance. Although overtime allowance was intended to be used for rather occasional situations when more labour is temporarily required, it is mostly used for topping up the salaries or wages of certain employees. The maximum disburseable for overtime is set by NUWC Headquarters and the state director's office and is distributed to selected employees in a more or less historically determined way. It is also used to reduce the number of shifts, from four to three, at some pumping stations. In a situation of overstaffing, reassigning duties may lead to considerable savings.
Little scope for performance-related incentives	ISMDP has tried to convince NUWC Nyala to bring the overtime allocation more in line with the actual extra hours worked or with improved performance. However, historical patterns appear to be hard to change and no lasting effect can be found. Local culture is not conducive to favouring individuals who distinguish themselves through special performance. Neither can sanctions be applied in cases of less than serious misconduct. Under such circumstances there is little scope for introducing a new performance-related incentive.

4.7 Communication and Coordination

A water utility such as the Nyala operations of the NUWC communicates with various levels of the authority and with various agencies. These include but are not exclusive to: local authorities, coordinating bodies, suppliers and clients, the state director and national staff, and, internally. The nature and form of these communications vary accordingly.

Focused meetings for more results

Meetings with local authorities and coordinating organizations, such as the Water Resources Management Board and the Nyala Services Committee, are mostly pre-arranged, but less official meetings also take place. It has been observed that the same subjects are discussed over and over again. Recording of discussions, ideas to consider, proposals and decisions could reduce much duplication of work. The local management of NUWC could contribute to improving the way in which organizations communicate by setting an example. Focused meetings will lead to faster and better decision making. Making, keeping and consulting proper records of meetings is an essential tool towards improved efficiency. NUWC Nyala has appointed an Executive Office Manager who has as part of his tasks, to keep the minutes and records of all meetings and to distribute these to the relevant staff for follow-up action. He should be present at all official meetings in which the water corporation participates and should be briefed after other meetings to establish a paper-based record. This functionary should always be asked to present management with files on previous meeting as a preparation for upcoming meetings

All arrangements should be well recorded

The same is true for communication with the large suppliers, which are the National Electricity Corporation (NEC) for power, the National Rural Water Corporation (NRWC) for borehole drilling, and the local office of the Ministry of Finance and Economic Planning for fuel supply. Any arrangement made between suppliers and clients is to be confirmed in writing, not only for own reference but especially to illustrate reporting to either authorities or supervising offices.

More professional approach towards customers

Exchange of information with clients is done verbally, except for the communication with government institutions. These institutions should receive written bills monthly and are to comment in writing in case there is reason for disagreement. Further efforts to make the institutions pay are arranged through visits. ISMDP has proposed that a credit manager handles all communications on finance with institutions. He will be personally accountable, has to bring consistency into NUWC's approach towards the institutional customers, and is to keep complete records of all arrangements and commitments.

Well-established communication with community kiosks

The links with the kiosk committees are well-established as NUWC representatives are present during scheduled kiosk committee meetings and as these representatives regularly visit the kiosk munders. NUWC representatives, also called kiosk coordinators should report at least once a month in writing.

Communication with private connection customers

If NUWC has to convey information to its largest group of private connection clients, it mostly relies on radio, TV or loudspeaker trucks. This has the advantage that many are informed at the same time and others will hear about the message through word of mouth. The messages through these channels can only be short. Tariff information can and is easily be spread through stencilled messages posted on strategic points throughout the town. The NUWC should clearly indicate which office or staff member is assigned to deal with queries and messages from the private connection clients. Although discussed many times before, a public relations desk has not yet been opened in Nyala.

Missing feedback from Headquarters

Though reporting to supervising offices is already rather well prescribed and routines are rather well-established, the completeness and clarity leaves considerable room for improvement. The supervising offices can help to raise the quality by informing the local office about shortcomings and inadequacies found in submitted reports and correspondence.

Radio links between towns

In Darfur a telephone communication system is virtually non-existent but the four NUWC branch offices can communicate with each other and with the state director's office by radio. If during these communications any commitment is made, it should be confirmed in writing. In case of a financial commitment, a record in the logbooks should also include a code given by the authorizing party. The same authorizing code can be used for authorizations through NUWC's banks to speed up disbursement of funds. The state director and other staff of his office visit the local water corporations in other town several times a year. These visitors are not only briefed on progress but also talk with all staff of the local water corporation.

Written instructions for precision and reference

In an organization most executive decisions are made by a small management group or by the general manager alone. If these require action from others in the organization, orders or work instructions must be channelled to the group or person who has to carry it out. The person sending the message has to remember how well similar orders have been carried out in the past. This is important in selecting the way he will send his message. As most orders go from chief water engineer, through department head and section chief to the worker, there is quite some chance that the message does not arrive in

the same form it was issued. For these and other reasons, it is strongly advisable that orders, that are either quite important and/or have not been executed as intended in the past, are given in writing to the section chief. Most routine work does not require communication and only the changes or exceptions should receive attention.

From oral tradition towards paper-trace

The same applies to decisions taken during meetings with department and section chiefs. Although these meetings are mostly intended to discuss progress and bottlenecks hampering such progress, the gatherings give a good opportunity to the chiefs to comment on former instructions and their usefulness. In this way the chiefs can share the concerns of the workers with management. Periodically the management organizes an open staff meeting. During these public events, all staff can speak out without having to use their superior as a channel.

The personnel section is always open for staff to discuss, or provide information on, matters concerning them as an employee.

4.8 Estimating the Organization's Efficiency and Effectiveness

Measuring how well an organization performs

To measure how well an organization is functioning, Euroconsult has developed the Institutional Capability Index (ICI). This instrument can help to estimate how well a town's water corporation operates and, if applied at certain intervals, it can show if operational efficiency improvements have been made. It could also be used to compare the same types of institutions in different towns.

Twelve different dimensions of capability are examined by looking at 6 to 14 aspects within each of these dimensions. The twelve dimensions used are:

- a. *Effectiveness:*
 - 1. technological soundness;
 - 2. needs assessment;
 - 3. service delivery;
 - 4. ability to relate to customers.

- b. *Efficiency:*
 - 5. administrative capability;
 - 6. financial management;
 - 7. organizational soundness;
 - 8. human resources development.

- c. *Survival:*
 - 9. Economic soundness;
 - 10. Linkage capability;
 - 11. Planning capability;
 - 12. Learning capability.

The full set of indicators for each of the 12 dimensions is found in Annex B.

Each aspect (indicator) is rated and given a score between -2 and +2. For each of the twelve dimensions, a dimension score is calculated by taking the average of the indicator scores within that dimension. One can still calculate the average of all dimensions, as some kind of global indicator of institutional capability, but it is doubtful if this total average is a meaningful measure.

However, each of the twelve dimensional averages give a good insight on the different capabilities.

Although the ICI is a useful instrument to determine what needs to be improved in an organization, the dimensional scores are only helpful if the person who rates the organization really knows the organization well enough and at the same time judges objectively. The two ISMDP coordinators who have worked in Darfur had gained enough insight to make a judgement. Short-term visitors rely too much on information from the organization's staff which could easily lead to a biased outcome. Ratings by staff themselves are also likely to lack objectivity

If the ICI is applied at certain intervals, it has to be done by the same person as the difference in rating between these evaluators may be greater than the score change over time. The dimensional scores (averages of the individual indicator scores) are built up from elements, which may not all have the same importance for the capability of the organization. In other words, the dimensional scores are composed of extremely important and less important elements. This shortcoming could be corrected by attaching a greater weight to the more important indicator scores, but no effort has been made to do this, because of the difficulty to determine what those weights should be.

It can be seen from the description of the individual indicators (see. Institutional Capability Index in Annex B) that some of the individual scores are seriously affected by the level of performance of other organizations and are therefore largely outside the control of the institution that is evaluated.

The ICI has been applied three times. just before the first ISMDP coordinator left, then shortly after the arrival of the second coordinator, and at the end of the project. The results are shown overleaf.

Scores of the Institutional Capability Indexes			
Score dates	11/91	7/92	11/93
1 Technological soundness	- 1 1	- 0 7	+ 0 2
2 Needs assessment	- 0 17	- 0 85	+ 0 17
3 Service delivery	- 0 3	- 0 67	0
4 Ability to relate to customers	+ 0 25	- 0 17	+ 0 33
5 Administrative capability	- 0 78	- 1 22	+ 1 11
6 Financial management	- 1 0	- 0 5	+ 0 67
7 Organizational soundness	+ 0 6	- 0 4	+ 0 7
8. Human resources development	+ 1 0	- 1 0	+ 0 43
9 Economic soundness	- 0 33	- 0 87	+ 0 87
10 Linkage capability	+ 0 07	- 0 71	- 0 21
11 Planning capability	- 0 67	- 1 33	0
12 Learning capability	+ 0 25	- 1 33	+ 0 58
Overall institutional capability (This composite indicator may be of little value)	- 0 35	- 0 81	+ 0 45

As can be seen from the above figures there has been an improvement in the efficiency and effectiveness of the NUWC operations in Nyala.

4.9 Skills and Staff Training

Maintenance and pipeline section staff benefitted from two long courses

It was the 1988 mid-term WSEP evaluation that urged, among other things, to upgrade staff skills at the Darfur branches of NUWC. The ISMD project started by developing training for the technical staff in cooperation with Nyala's Technical High School. During two summers, six-week courses have been given to most classified technicians in the maintenance and pipeline repair sections. As the scheduled course subjects could not be completed during one six-week session, another one has been added. These courses provided the theoretical background to the work that the staff from Nyala, Zalingei and El Geneina had been performing for sometimes more than 20 years. Every day, besides theory, several hours of practical training have been supplied. For the pipeline section staff, this included work with all the pipeline materials, couplings and valves that have been introduced in those towns. It included the proper ways of cutting, sawing and connecting PVC tubing to metal couplings. The use of the pipe threader was specially highlighted as this technique had not been properly applied till then. Before the projects had delivered the proper tools, much water was lost as watertight connections could not be made. Electricians have been trained especially in the use of measuring and test instruments as well as in theory and wiring design. Much emphasis has been placed on the upkeep of the control circuitry of pumps.

Vocational training at Nyala Ministry of Labour/ ILO centre	Two of Nyala's junior car mechanics have received a basic, four-month, full-time training at the Ministry of Labour/ILO vocational training centre in Nyala. An advanced course for Nyala's senior vehicle mechanic had also been planned but unfortunately the training centre could not organize this course before the ISMD project came to an end.
Thirty staff trained at MDC Khartoum	<p>About thirty senior and middle level NUWC staff from all Darfur towns have received training (one up to six weeks) at the Management Development Centre in Khartoum. These courses included:</p> <ul style="list-style-type: none"> - developing supervisory skills - office management and procedure simplification - maintenance management - manpower planning - basics of general supervision - leadership skills - basic general management - human resources management - production management - procurement and stores management
Supply Officers Institute: 3½-month course	One Nyala store manager has been offered a 3½-month, full-time course at the Supply Officers Institute in Khartoum which is said to be the most extensive course in this field provided in the Sudan.
Accountancy courses	In 1991, ISMDP invited Khartoum's MDC to organize a two-week, full-time course for accountants in Nyala. About twenty accountants from the Darfur towns and even a few from NUWC Headquarters in Khartoum have participated in a course on double-entry commercial accounting. This course has been repeated in April 1993, just before this accounting system was officially introduced in Nyala.
On-the-job training for accountants	For the introduction of double-entry accounting at the general accounts section in Nyala, ISMDP has contracted a Sudanese consulting firm, which has stationed a trainer in Nyala for altogether about three months. After the first session, the accountants were given the opportunity to apply the new system alone. After about six weeks, the trainer returned to evaluate the success of the first session and to assist with those aspects that were still not fully understood by the accountants. During the second session, the system was introduced, tested and, where necessary, adjusted. Because the section had been many months late in the upkeep of the books, much training time had been lost in catching up. This was caused by very weak leadership in the accounts department and especially in the general accounts section. Only rather late in the training has this problem been addressed, although much valuable training time has been lost. Several accountants with little capabilities have been

removed and the inspector of accounts has been replaced. During the third and last training session much progress could be made. The local consultant was to prepare an accounting manual, based on the proposal of Euroconsult's financial and accounting advisor, which is laid down in his reports of October 1992 and May 1993

At the closing of the ISMD project in November 1993, the local consultant had only submitted a draft of this manual and as yet remarks from Nyala's inspector of accounts and ISMDP have not been addressed.

**Professional development
for senior staff**

As the situation in the Sudan gives very few opportunities for the chief water engineer and his deputy for professional stimulation in the form of books, conferences or exchange visits, efforts have been made to send them abroad for courses or training visits. The Dutch donor has been extremely reluctant to sponsor a training in Europe and ISMDP has made preparations for the chief water engineer for a one-month internship at a larger city waterworks in Egypt. Although efforts started in mid-1992, it became only clear by mid-1993 that the strained relations between the two countries made this definitely impossible. At this time it was announced that the chief water engineer was soon to be transferred to another town and not enough time was left till the end of the project to arrange a similar internship in another nearby country

The deputy of the chief water engineer had already left Nyala by the end of 1992 and, although he has been replaced, this engineer also left after a few months.

**Pre- and post-training
statements to be made by
course participants**

To enhance the effectiveness of the training pre- and post-training statement forms have been made by ISMDP. These have been completed by almost all persons who have been sent on courses. In the pre-training statements, they were to describe their current responsibilities, their present level of skills and knowledge in relation to their responsibilities, any deficiencies and their expectations with regard to the course to be attended. In the post-training statement, they should have summarized course content and the significance to their work. They were to evaluate the effectiveness, style and efficiency of the course and outline how they were going to apply what was learned. ISMDP had all the filled in statements translated into English, but, apart from the copied course contents, so few significant comments have been recorded that a planned systematic evaluation could not lead to a useful result.



Improving Management Skills



Greater Efficiency in Financial Management

5 MANAGEMENT DEVELOPMENT

Advice to the leadership One of the major objectives of the ISMD project has been: the improvement of the capability of the senior staff to manage and plan operations of the Nyala and El Geneina branches. Mostly this has taken the shape of advice to the leadership of the Nyala branch on procedures, style of work, use of information, staffing and related subjects. Progress can be observed in areas where the leadership of this branch has been receptive.

5.1 The Strategy

Little concrete information by which to steer ISMDP first paid attention to the overall picture of the branches in Nyala and El Geneina. At the start of the project, it appeared that the chief water engineers had very little concrete information about the organization they had to manage. This information can be classified in three categories:

- technical information (water produced, pumping hours, fuel consumption, use of labour, etc.)
- market information (number of clients, willingness to pay, location of potential new customers, etc)
- financial information (income from different sources, expenditure, collection efficiency, cost coverage and cost structure).

Until then management had navigated on such signals as, not enough cash to meet the wages bill; customers complaining about irregular and/or insufficient water supply; water leaks not being repaired for days.

Three main steps have been taken so management could take decisions based on knowledge rather than guesses:

Information on what happens in the corporation

- *Management information data.* Under the guidance of WSEP and ISMDP, bulk meters have been placed in Nyala to measure all the water that is produced. In both towns, the water which is pumped to the community-managed kiosks is metered. At different times, water samples have been taken and sent to a laboratory for analysis. All the forms used are shown in the Annexes. All these data are summarized in the technical part of the monthly Management Information Sheet (MIS sheet). Data on pipe repairs, number of disconnections and reconnections as well as new connections are provided, respectively by the pipeline section (PLS) and meter mechanical and inspection section (MMIS). The purchasing and stores section reports on fuel consumption, while the personnel section provides data on staffing. All this information is presented to the management within ten days after the end of the report

month. A comparison is made with the figures of the month before so changes can easily be detected and studied. This MIS sheet gives a basic outline of what is happening in the NUWC branch.

Information on the customers

- *Socio-economic survey in Nyala.* The report from this survey gave NUWC Nyala an indication who their potential customers are, where they live, their family size, how much water they use and how they get their water now, and what they are prepared to pay for water. The survey has been carried out by a consultant of Euroconsult and he has published his report in August 1991.

Information on money flows

- *Financial information data.* On the reverse side of the MIS sheet, financial information including revenue and expenditures for the month are obtained from the accounts department. The cashier in the treasury section classifies the daily income by type of customer. All these daily data are added up to a monthly total per customer group, which is presented on the monthly summary sheet. Expenditures are divided into staff cost and operations/maintenance expenses. All money movements such as personnel loans and other transfers should not be included in the category of expenses. Transfers-in from the state office and transfers-out to other towns are recorded separately. With these data on paper, management can immediately calculate the surplus or deficit from operations, as well as the cash flow surplus or deficit. The cash and bank balances at the end of the month are also recorded and their total have to reflect the effect of the cash flow surplus or deficit. As all the water sold to kiosks is measured and payments by kiosks are registered separately, the portion of water paid for, in relation to all water supplied to this category, can be calculated which we call the collection efficiency for kiosks.

Spotlight on the sections

After data from the MIS sheets became available in Nyala, the management took more resolute steps to keep income higher than expenses. To collect all basic information on one single sheet every month is very helpful to get a quick impression and to see if matters are improving or not. However, this compact set of data is not enough to make decisions on what has to happen within the sections. Therefore, a set of instruments have been developed for the *planning and monitoring at the section level.*

What should the sections do

- *Sectional task descriptions* clearly and briefly state which function a section is required to fulfil (the tasks have been defined in consultation with the section chiefs).

How are the sections organized

- *Section descriptions* give in a few pages an outline of the tasks, the work procedures, targets, work-load, staff requirements, structure, issues and options. These section descriptions may be expanded to include other useful information but should remain compact (max. 6 pages) and be updated at least every three months (ideally by the chief water engineer, the head of department and the section chief together) to reflect changes in tasks, systems and staff. Their main purpose is to inform management on the status of the section and to check if all mentioned elements are still in coherence with each other. The section descriptions are basic tools for planning and are especially useful to determine the labour efficiency of a section.

What do the sections actually do

- *Sectional reporting forms* have been developed to inform management on the progress in the sections which can be checked against tasks, targets and instructions. The reports are to be submitted within three days (for monthly reports) or in one day (for the rather short weekly reports). Only few sections have to submit weekly reports. The weekly report will be studied immediately as its information might require quick action. Information on progress from monthly reports, after review by management, is discussed during the monthly meeting with all department and section chiefs.

Who does what in the section

- *Job descriptions forms* have been completed by the section chief and personnel officer, possibly assisted by a member of the management team. All elements of sectional tasks have to be allocated to one of the positions in the section. An updated set of job description forms is to be kept with the section descriptions.

Evaluating the individual

- *Personnel evaluation forms* have been designed and introduced in Nyala. These forms must become a basic tool to investigate all possibilities for staff reassignments. In early 1993, these forms had been completed for most Nyala staff. The supervisor clearly had difficulties to judge the performance and capacities of people objectively. As most senior staff find it difficult to make objective judgements, many staff were evaluated as "first class", this is not surprising in the prevailing social environment and thus the value of this management tool is limited.

The work-load and how the corporation deals with it

- *A work-load and work organization study* has been carried out at NUWC Nyala to produce a systematic inventory of the main functions to be performed by the Nyala branch and clusters of tasks to be assigned to sections. This study was not only intended to provide information on the current situation, but hopefully also guidelines for the

future and was to include a detailed analysis of the aim, nature and size of each task. The study should present precise descriptions of all responsibilities of the different staff members. An analysis will be included of work-loads per section, work group and individual positions. Unfortunately, at the time this document was written, the report of the study had not been presented in a final form by the assigned local consultant. In the meantime, much of this work has been done by ISMDP and presented in the *section descriptions*.

The accounting system needed upgrading

As the Nyala branch needed more appropriate tools to better understand and control its financial position, a commercial double-entry accounting system has been developed and introduced in 1993. The knowledge and control that are now becoming available are especially useful now the regional and local water corporation will have to cover its own expenses and will have to make its own decisions to reach these targets. This system not only has to provide periodic profit/loss reports and balances, it also arranges the financial data in such a way that a wide range of financial management reports can be easily generated. Once the system is fully operational, the chief water engineer will no longer be constrained by inadequate financial information on the corporation he has to manage (see NUWC/ISMDP/Euroconsult report of the financial and accounting specialist, October 1992).

5.2 The Structure

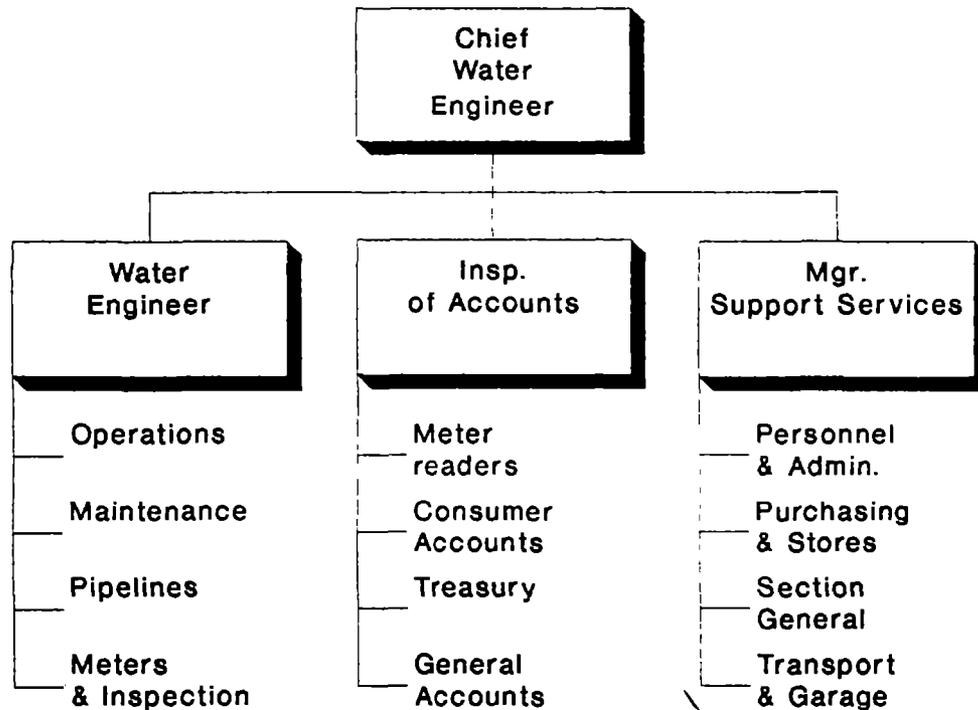
There are as many different versions of the type of structure that the corporation should have, at the urban centre level, as there are chiefs, but most staff see the section chief as their direct supervisor. Leaders of work groups are found in a few sections but this does not constitute an extra hierarchical level. The organizational structure of the Nyala branch is best seen as a functional division of the corporation into three departments, each divided into several sections:

Three departments each with four sections

- Production and distribution department under the leadership of the water engineer, with sections for:
 - operations
 - maintenance
 - pipelines
 - meter mechanical and inspection.

- Accounts department under the leadership of the inspector of accounts, with sections for:
 - meter reading
 - consumer accounts
 - treasury
 - general accounts.

National Urban Water Corporation



Proposal October 1993

Figure 5 Organization Chart Nyala

- Supporting services department under the leadership of the manager of support services, with sections for:
 - personnel and administration
 - purchasing and stores
 - transportation and garage
 - general (watchmen and messengers).

The largest section in Nyala in August 1993 is the pipeline section with 37 staff. The chief of this section has indicated that its size can still be adequately managed by him. (However, the work-load analysis has revealed that the amount of work only justifies 17-20 staff.)

Vacancies at management level

During 1992 and 1993, most of the heads of department were absent, and none of the section chiefs had been temporarily appointed as acting departmental heads, thus the general manager was obliged to supervise directly each of the sections. This wide "span of control" is too great for one person to manage effectively. It is important therefore that the corporation appoints new chiefs as soon as is possible before there are serious effects on the performance of the departments.

5.3 Management Style

What determines management style

The management style at NUWC Nyala is determined by several factors:

- Most employees have little education and have joined the corporation as casual labourer or at another low rank.
- Most employees have a rural town or village background and give great importance to group solidarity and consensus. In the group individuals are not encouraged to distinguish themselves with outstanding performance (suppression of competitive tendencies). This explains why personnel evaluations hardly ever disclose distinguishing characteristics.
- Secondary school and higher trained staff have difficulties applying their knowledge and insight in an environment dominated by colleagues who have been promoted on seniority only.
- With the introduction of new equipment, systems and materials it is necessary to introduce new "rules" and procedures. However, it has been repeatedly shown that staff will try to follow their old ways and only after many failures and mistakes will they attempt to adopt the new procedures. To change "custom and practice" in this social environment is a very gradual process and is seen as a threat to an employee's stability and security.
- Managers appointed from outside have to play safe and are reluctant to make changes which involves the risk of losing face.

Developing a vision

It is of great importance that management should develop a vision of how the branch or department under their responsibility should develop in the future.

Sharing the vision

This vision developed by management is to be shared with the staff in meetings for comments and adjustments. The state office and the town's services committee is to be kept informed at all stages so ideas can be tested to conform with more central policies.

Making people change the way they work

Employee training can be a good tool to bring about changes. Most managers try to introduce new and better ways to get things done. During the last few years, many employees have been sent for training, which gives management good opportunities to implement the changes which were dealt with in the training.

Courage to make change

Overtime allowance is frequently used for rewarding other aspects of work other than the extra hours worked. Changing the traditionally held belief that overtime payments are rewards for "special" persons and not for extra work, takes time and courage on the part of the management. Other

means have to be found that can be used to reward staff for improved performance and as incentives.

Persistence and support for the change process

Changes in management style and systems will have an effect on the way staff do their jobs, on their social relations within the corporation and on their status. Unavoidably this will lead to resistance and even obstruction. Management will have to mobilize sponsors, at different levels in the corporation, to give the programmes a decent chance of success. If changes are desired and improvements are to be continued, then funds must be set aside and staff made available for this to happen.

5.4 Management Systems

Formalized regular supporting

In 1992, few basic formal management systems were in place, and these were mainly personnel management and financial reporting systems.

The 1988 mid-term review mission identified, among other things, the need for improvement in maintenance and in revenue collection. By then, management had neither the information to assess the situation nor the systems to monitor any change. Much depended on verbal communication and, if managers were absent or replaced, data were not available. Since 1993, all sections of NUWC Nyala are to produce a weekly or monthly written report on a pre-printed form. The section chiefs are personally responsible for these reports which must contain information on:

- use of staff time
- work performed
- results obtained
- for routine jobs: any exceptions.

Checks on reception and completeness of reports

In addition, the accounts sections report weekly and/or monthly on the financial situation of the branch. Copies and examples of all these reports can be found in the Annexes. The Nyala executive office manager checks if all these reports are complete and handed in on time. This person also analyses these data, files them and discusses them with management. Before the 10th of every month, a meeting is held with the heads of department and all section chiefs to compare the results with the set targets and instructions. The section chief can give further detailed information, plans can be adjusted and new instructions can be issued. It is important that a decision and/or new instructions are recorded and presented in writing to those who have to carry them out. All intermediate instructions should also be presented in writing to the section chiefs.

Sections participated in the report-form design

The reporting systems and the forms used in these systems were designed in close collaboration with all section chiefs.

Consequently they appear to be completed with enthusiasm and usually with an unexpected degree of accuracy.

Daily management meetings

The chief water engineer should meet daily with the heads of department, to discuss at least the following issues:

- status of boreholes and pumps
- absence of staff and leave approval
- daily cash status
- revenue collection and arrears status
- upkeep of accounts books
- new connections
- pipeline and valve chamber repair
- vehicle availability and repair
- procurement
- ongoing construction work
- progress in meter reading
- progress in disconnections and reconnections
- messages from Darfur office
- messages from Nyala.

On all points that are discussed, decisions for action should be taken, which have to be brought down to the section which has to provide the follow-up or has to provide feedback.

Executive office manager keeps meeting records

The executive office manager should be present during these management meeting and should make notes for instructions to the sections. He/she also collects all data which may be important for discussion in the monthly meeting with the section chiefs.

All elements that are important for the annual or longer-range planning should also be carefully recorded and filed, to be used during the annual budget preparations.



Involving the Community



Kiosk Committee Meetings

6 COMMUNITY PARTICIPATION

The WSEP and ISMD projects have introduced a system of community-managed water kiosks in the Sudan. Two other systems of kiosk management had previously been tried in Nyala and El Geneina, but both were unsuccessful. A system in which the community itself would participate was thought to be more effective and sustainable.

6.1 Choice for Community Kiosks

Kiosks operated by NUWC staff

In the past NUWC operated a system in which a government employee, as a kiosk minder, was responsible for revenue collection and kiosk management. The government employee was low in the hierarchy, had little opportunity for promotion and was not motivated. Consequently revenue collection was inadequate.

Kiosks operated by concessionaires

A second system was tried in which kiosks would be operated by concessionaires. These concessionaires paid a flat rental rate to the water corporation and could charge customers as much as they wanted. The amount of money they paid to the water corporation was little compared to the revenue which they received. As the installed water meters were defective, nothing was known about the actual supply to the kiosks. Reliability of supply was another problem, as concessionaires sometimes closed the taps when they were out of town or did not need the money.

Kiosk users manage kiosks themselves

For the new project kiosks to be effective, a system was introduced in which the kiosks would be managed by the kiosk users. Making the users themselves responsible for the operation and maintenance of the kiosk, would give them the feeling that it was their own property and this would motivate them to keep the kiosks operating efficiently.

6.2 Community Characteristics

Successful community involvement

Generally, certain factors have to be taken into account when successful community participation in development projects is to be achieved⁵.

On the community side there needs to be:

- security of tenure;

⁵ *Participatory Approaches to Urban Water Supply and Sanitation*, Madeleen Wegelein-Schuringa November 1992, IRC, International Reference Centre for Community Water Supply and Sanitation, the Hague

- a degree of social organization (some sort of homogeneity within the community, presence of formal or informal type of organization, stability);
- involvement of women (because women are usually responsible for water collection);
- motivation of the people involved (community efforts should bring substantial advantages to the people).

On the side of the water agency, the following issues have to be considered:

- the organizational framework;
- willingness to work with communities;
- flexibility on technical and social approach;
- integration of project components;
- sustainability of improvements.

In the WSEP/ISMDP projects, most of the above-mentioned pre-conditions were favourable, which is the reason for a successful community-based kiosk management system

Settlements should not be too recently established

The project kiosks were constructed in the fringe settlements around the centre of the towns. These areas already got a permanent status since the inhabitants had settled there several years before the start of the project. They were formally recognized by the local Government. This is in contrast to the scattered settlements on the outskirts of the town which were inhabited by more recent immigrants and where the Government can request these people to move any time.

Building on the community organization

Before the first kiosks were constructed, no form of local organization, tied to a public service, existed. Communication with the community went through respected persons from the neighbourhoods.

From 1990 onwards, according to the policy of the new national Government, people's committees were formed. These committees held regular meetings where community matters were discussed. When the construction of the Phase III kiosks in hai El Jebel/Nyala started, these people's committees had been functioning for several months. They were approached by the water corporation and thus were involved in locating the kiosks.

6.3 Locating the Kiosks

Locating kiosks need user involvement

The Nyala kiosks in hai El Sukar Shattat/Konghor and hai El Wahda were located according to the project engineers' and advisors' designs, based on aerial photographs and field visits. The planned kiosk sites were discussed with representatives of the areas and the town council. In spite of this, some kiosk locations proved to be inconvenient.

Community develops initiatives

After a survey carried out by ISMDP, the new WSEP designs for hai El Jebel/hai El Taiba and hai El Geer were adjusted. The original locations were slightly changed and it was decided that two extra kiosks were needed in hai El Jebel. The kiosk sites were discussed with the people's committees of the neighbourhood, who gave their consent to the revised proposals. Because no money was available for the two extra kiosks, it was decided that the community itself would do the trenching and construction of the kiosks, and would participate in paying for the pipes, fittings and kiosk materials.

The criteria for kiosk site selection were:

- no house connections were available,
- to benefit between 1,500 and 1,700 people or about 225 households (a larger group would also make community management more difficult);
- walking distance for most people should not exceed 500 m;
- to be situated in low-income areas only.

6.4 Managing the Kiosks

Kiosk regulations

The kiosks are operated through a set of kiosk rules, written down in the "kiosk regulations". These regulations contain water collection procedures and hygienic standards, a list of the responsibilities of NUWC and a specification of the tasks of the kiosk committees who operate, manage and maintain the kiosks.

Choosing a kiosk committee

When a kiosk is planned in a certain area, NUWC invites the inhabitants of that area for a meeting in which a kiosk committee has to be chosen.

Women should play a major role

It is explicitly mentioned that women are welcome, otherwise only men will show up. The meeting will be held at the kiosk location, so as to enable women to be present. Usually, about 100 people, men and women, attend the meeting. The NUWC representative informs them about the new system. He stresses that the people themselves have to play a role in keeping the kiosk in good order and that they are able to do this by choosing a kiosk committee. After the explanation by the NUWC representative, a committee will be elected, consisting of three male and three female members. Candidates for the committee can be proposed by the attendants of the meeting.

Community initiatives

The kiosk committee comes together once a month. At this meeting, a water corporation representative is present and acts as the chairman. All meetings are arranged in the neighbourhood of the kiosk so that women can be present.

The kiosk committee has to inform the NUWC representative when maintenance is required or when water supply is irregular. When problems arise which cannot be solved by the committee, the NUWC representative is asked for assistance.

The kiosk committee is responsible for the daily revenue collection, as well as for the recording and filing of revenue data.

The committee has to guarantee smooth operation of the kiosk by organizing people to queue up when necessary, prohibiting the filling of barrels at the kiosk site, checking the condition of water meters and valve chambers, and purchasing small fittings and new taps.

Furthermore, regulations concerning punishment for bad behaviour have to be set up by the committee and agreed by the community.

The committee selects a kiosk minder and keeps an eye on the proper execution of her tasks.

Tasks of the kiosk minder

The kiosk minder is usually a woman. She has to be present at the kiosk during the opening hours. Her tasks are:

- daily cleaning of the kiosk before opening hours;
- making sure that everyone gets the chance to enter;
- keeping children and animals out;
- making sure that everybody pays, receiving the money and putting it in an iron box;
- taking care that the money box is always locked and protected from rain and dirt;
- informing the kiosk committee when problems arise at the site of the kiosk.

During the first two years of operation of the kiosks, a watchman was also present at the kiosk. He had to assist the minder in keeping people waiting in line and prevent children from entering. Because the community was of the opinion that this watchman was not really necessary, it was decided that in the future the kiosk minder would carry out both jobs alone. Her salary would be doubled. Only in the dry season, when people sometimes are waiting in long queues, the tasks of a watchman would be performed either by one of the committee members, or by a hired person who would be paid for this purpose.

The remuneration of the kiosk minder has been £S 600 a month during 1993, and was doubled by the end of that year after the introduction of new water tariffs.

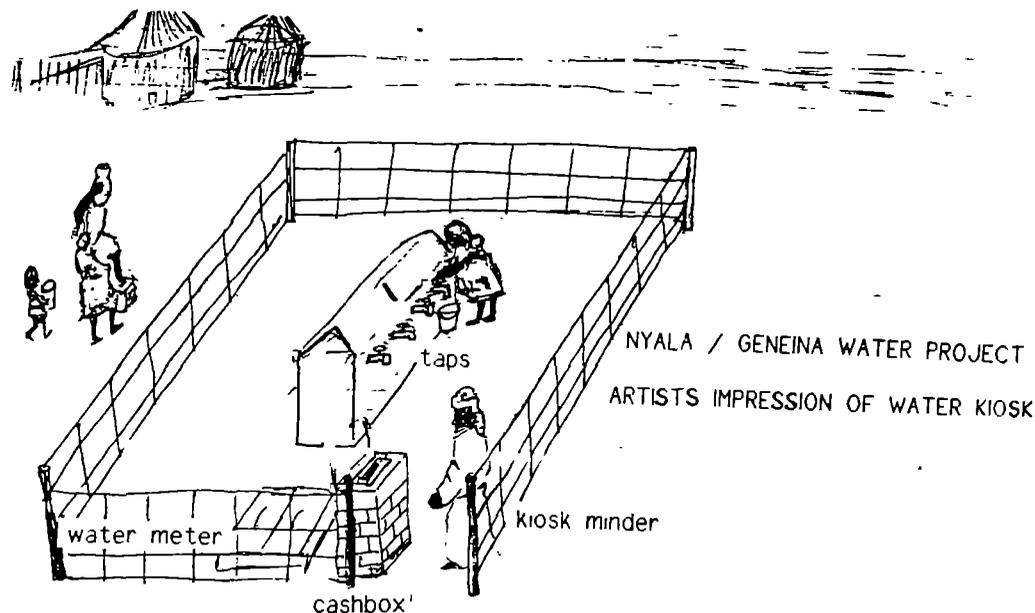


Figure 6 Artist's Impression of Water Kiosk

Some users did not obey the kiosk rules. For example, some wives of rich traders or high military officers thought they had more rights than other people. The committees felt that they had no power to deal with these people or to tell them they were wrong. Therefore, a clause in the kiosk regulations was added which gives the committee the official authority to discipline obstructive people.

6.5 Community Initiatives

Communities raise funds for their own kiosks

Inspired by the success of project kiosks elsewhere in the town, some communities organized themselves in order to present formal requests to the NUWC for the construction of kiosks in their areas. This was especially the case in areas where kiosks were already planned but could not be constructed due to lack of project funds. Communities cooperated in collecting money that was needed for purchasing goods, cement or for paying labourers. Some also provided labour inputs in trenching, pipe-laying and kiosk construction.

Communities that could not be provided by the project, started to make extensions to their own neighbourhood to build their own kiosk.

During the project, the following community activities were recorded:

- trenching and fencing for a sixth kiosk in hai El Wahda; ISMD provided labourers, WSEP materials;
- trenching and fencing for a seventh kiosk in hai El Wahda; ISMD provided labourers, the community bought pipes and fittings;
- paying the contractor for the construction of nine project kiosks in hai El Jebel;
- trenching for and construction of two extra kiosks in hai El Jebel as well as the payment for pipes, fittings and kiosk materials;
- trenching and pipe-laying for one extra kiosk in Khartoum Beileil and one in Konghor; the water corporation provided a supervisor; the community bought pipes and cement.

6.6 Role of the Local NUWC

As mentioned at the beginning of this chapter, several conditions related to the NUWC play a role in achieving successful and sustainable community participation.

Institutional framework

The WSEP and ISMD projects were implemented by the National Projects Office of the National Urban Water Corporation, a public institution, falling under the responsibility of the Ministry of Irrigation and Water Resources. The advantage of operating through a public utility is that government support is guaranteed and no opposition is to be feared. In both Nyala and El Geneina, the town councils have always been willing to assist. Moreover, being a public agency, the local water corporation was automatically involved in organizations like the Public Services Committee and the Technical Committee of the Water Resources Management Project.

People's committees, which have been installed on the instigation of the local Government, played an important role in representing peoples demands and wishes concerning water supply. Moreover, they facilitated communication between the NUWC and communities.

The organizational structure of the NUWC, as described in Chapter 2, was more limiting than stimulating. Feedback from the central management in Khartoum could have facilitated replicability of a community-based approach to the management of some of the facilities, particularly public water kiosks in other parts of the country. In practice, little support from Headquarters was felt and little interest in replication seemed to exist. Moreover, the execution of the

project was seriously hampered by the lack of a cooperative attitude from NUWC Headquarters.

Willingness to work with the community

NUWC staff is not familiar with a service- or client-oriented approach. This does not mean, however, that the water corporations in Nyala and El Geneina are not willing to cooperate with the community.

During the projects, two water corporation representatives have been appointed. One of them is responsible for communication with the kiosk committees. He organizes regular kiosk committee meetings in which he participates as chairman. The kiosk committees keep the representative informed about technical as well as management problems and users' complaints. The representative tries to find appropriate solutions and reports back to the chief water engineer of the water corporation. His task is further to visit the kiosks during the opening hours, observe their operation and give advice, when necessary.

Another NUWC employee from a technical department is responsible for actual repairs and installations at kiosks which are outside the scope of the committees. He attends the kiosk committee meetings to advise on technical issues.

Flexibility of technical and social approach

From the beginning of the project, technical designs and solutions have been kept simple. When necessary, adaptations were made according to recommendations of kiosk users. Different sorts of taps have been tried and models that were not satisfactory were abandoned.

Some inconvenience was experienced in the use of the first kiosks constructed by WSEP. Hence, the original design was changed, making kiosk use easier and reducing the chance of wasting water.

6.7 How it Works

Community participation was successfully integrated in the construction and operation of kiosk extensions in Nyala and El Geneina. Kiosk locations were discussed with the people living in the neighbourhood. Communities were involved in kiosk management by selecting a kiosk committee for the operation and maintenance of their kiosks. Users' complaints were heard and solutions were sought.

From common interest to community activity

Although in the first phase of the project, no kind of organization was yet in existence, and some communities were rather heterogenous, people started cooperating because of a common interest in a supply of cheap and safe water. Thus, the kiosks fulfilled an important social function as well!

The fact that some kiosk committees were functioning better than others, had more to do with personal characteristics and interests of the committee members, than with the system as such.

Role of women

One of the reasons for successful community participation is the important role that was given to women in the supervision and management of the kiosks. Also, special arrangements were foreseen in order to enable women to attend meetings. Women are responsible for the collection and use of water, and therefore it was essential to involve them in decision-making.

Formal rules to back the system

Also important is the relation of the committees with the NUWC, which is formalized in the kiosk regulations. Two NUWC representatives meet regularly with the committees, visit the kiosks and give follow-up by presenting solutions to technical, social and service-related problems and by reporting to the chief water engineer of the water corporation.

Be flexible but keep what works

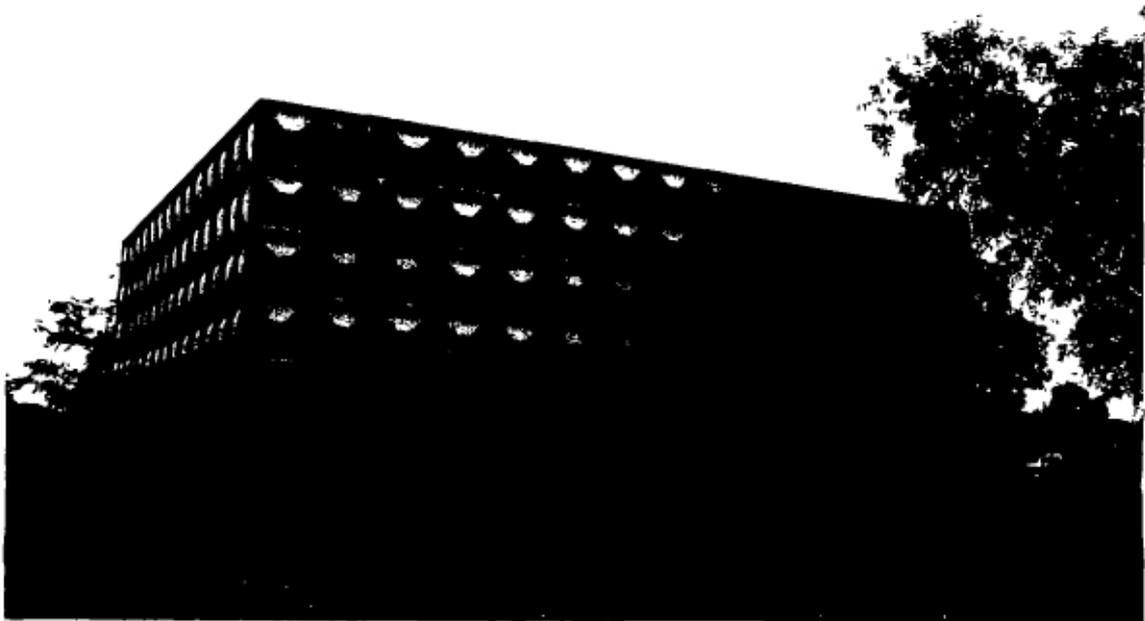
This system of community-managed kiosks has been practised now for about five years. During this time, changes were made in kiosk design, the method of revenue collection, opening hours, etc. The flexibility of the system and the continuous dialogue between users and water corporation will leave the possibility for more changes in the future, thereby increasing sustainability.

NUWC to act on community initiatives

The Nyala/El Geneina experience has shown that willingness exists among communities to make substantial efforts for a better water supply. It is the task of the water corporation to support these initiatives. This could be done by creating a special desk or department where people can go, whenever they need advice or assistance from the NUWC.



Satisfied Customers, Young and Old



Newly Installed Holding Tanks

7 RESULTS OF THE WATER SUPPLY EXTENSION PROJECT

Rocky formation slows down trenching

By October 1988 most of the work in Nyala, scheduled for the initial phase, had been completed. Four boreholes had been drilled, two of them supplied with submersible pumps, while the pumping station at the NUWC compound had been provided with two new booster pumps. The pipeline extension to hai El Sukar Shattat/Konghor was finished in April 1988 and the construction of the kiosks in July 1988. Two elevated water storage tanks complemented the infrastructure in this area. At this time excavation for the hai El Wahda line and the construction of an elevated tank were still ongoing because of the hard soil conditions but the kiosks for hai El Wahda were ready by August 1988.

Also delays in El Geneina

At the same time in El Geneina, the new Disa line was completed as well as the BH13 line on which nine of the ten kiosks were constructed. The BH13 pump was not yet installed, however, so the newly built kiosks could not yet become operational. One borehole was drilled in Ardamatta. Trenching for the Ardamatta kiosk extension was finished but pipe-laying, kiosk construction, and the installation of an elevated tank had to be completed in a later phase of the project. All kiosks in El Geneina and Adarmata still had to be supplied with thrust blocks, meter and valve chambers, which was postponed to a later phase.

Rehabilitation of Nyala's old network

During the years 1989 and 1990, the old reticulation network in Nyala has been rehabilitated and upgraded. This was necessary because the performance of the newly installed project equipment and infrastructure would have been reduced, had not the old network also been improved. The pump house was supplied with two new booster pumps as well as a distribution panel, new cables and bulk meters for both the town supply and the kiosks network. In El Geneina, the pipeline from GP06 to the Disa wells site and the Kaja main were replaced with ductile iron pipes.

El Geneina training

During this period training was given in El Geneina for electricians, operators and mechanics, concerning troubleshooting, repair and maintenance work on generators and switchboards. The training, however, had little impact, because there was a shortage of staff that could attend the training. Moreover, the staff that was present had too little background knowledge and/or interest for the training to be effective. Work left over from the first phase of the project was completed in 1990:

Nyala:

- installation of submersible pumps in the two new boreholes A9 and A3 (A9 proved to be non-productive and A3 was washed away by a flood);

- construction of elevated tank in hai El Wahda

El Geneina:

- completion of kiosks in Ardamatta;
- replacement of Disa line with polythene pipes.

In the last phase of WSEP (1991-1993) the following achievement have been made in Nyala:

- Three new boreholes were drilled in the eastern part of the wadi and supplied with submersible pumps.
- At the NUWC compound, a new storage tank, with a capacity of 840 m³, was completed in December 1992.
- Water meters have been installed at eight kiosks in July 1993 while also five more bulk meters have been placed.
- The ring line for connecting the storage tank with the boreholes and the hai El Jebel/Taiba extension was ready by the end of the project. The boreholes in the eastern well field were connected to this ring line in the spring and summer of 1992.
- The extension to hai El Jebel/Taiba was finished by the summer of 1993. Fifteen kiosks in hai El Jebel/Taiba were constructed with the assistance of the community and completed by mid November 1993.
- Trenching and pipe-laying for hai El Geer was still ongoing by the end of November 1993 and all kiosks are still to be constructed

During that period the achievements in El Geneina have been:

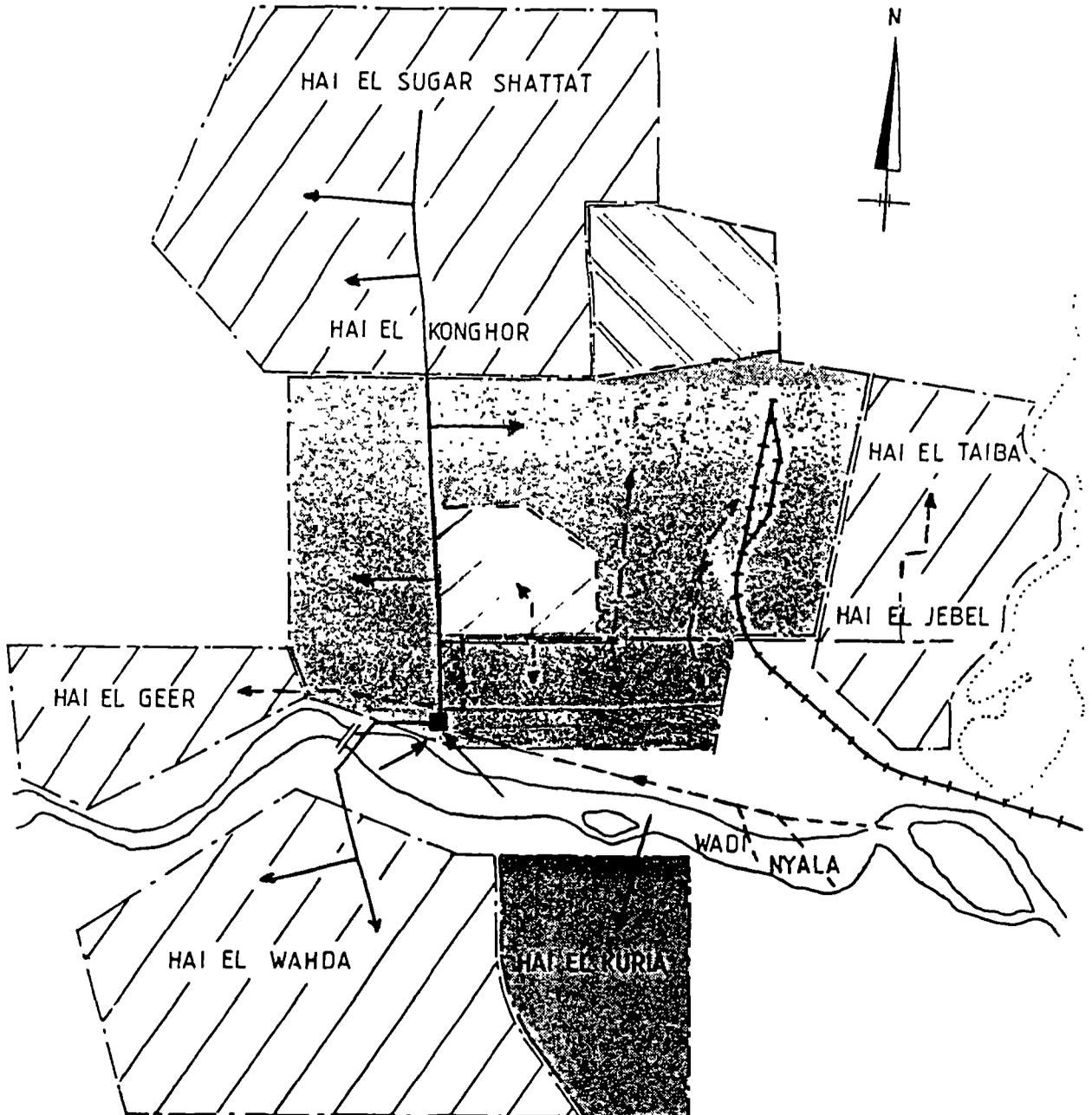
- Four boreholes were drilled at the BH13 station of which three have been supplied with submersible pumps. Two generators were also installed at the BH13 site. The pumps, however, were not yet all connected to the network by the end of the project.
- Two borehole pumps and a generator were installed at the Disa wells site. In Ardamatta, the borehole drilled by the project was supplied with a submersible pump, the generator repaired and a generator house constructed.
- Connections between BH13 line and Disa and Kaja, and between Kaja and Disa were made.

As can be concluded from the above, some of the planned extensions and improvements were still being executed by November 1993. Some, such as the extension to Ummdein in El Geneina and the upgrading of Nyala north, were never even started.

Some problems have persisted during the entire length of the construction project.

Non-availability of funds

The disbursement of project funds was problematic. In November 1989, no quotations for the building of kiosks in hai El Jebel could be made, because the outstanding funds were not yet released. In February 1990, the project was still waiting for this money, which amounted by then up to £S 1 million. No materials such as bricks, cement and wires for the kiosks could be purchased. A crane for laying big pipes could not be rented and contractors could not be paid.



Map 6 The Coverage of Nyala by the WSEP

Transportation	One of the reasons for delays in construction activities was the time-consuming procurement procedure and transport difficulties to western Sudan. On occasions, the project had to wait for over a year for trains to transport pipes and fittings from Port Sudan.
Casual workers	Even during the later years of the project, difficulties in attracting casual labourers were still experienced because government wage levels were not attractive enough. On average, there were about 16 labourers available for trench digging, which was not enough to make the required progress. Sometimes only three labourers were working.
Drilling boreholes	Delays occurred in the drilling of boreholes by the National Rural Water Corporation. The NRWC was facing the same problems as the NUWC concerning logistics and lack of materials, machines or spare parts. Sometimes manpower and drilling equipment were not available due to involvement in other drilling activities in rural areas. Another constraint was the contract between NUWC with the NRWC: every borehole that was drilled had to be paid for, even when it proved to be a failure. This meant that drilling boreholes was a costly activity.
Lack of skilled labour	The labourers involved in project activities had insufficient skills. Pipes got blocked because of careless pipe-laying and improper closure of pipe-ends. Ignorance on the part of the labourers, and repairs done by trial and error, were ruining equipment and tools. Therefore, much work had to be done over and over again, and extra costs had to be incurred for supplying new materials.



Policy Decision - Community Involvement



Measuring Flows to Measure Improvements

8 **RESULTS OF THE INSTITUTIONAL STRENGTHENING AND MANAGEMENT DEVELOPMENT PROJECT**

Implementation of the pilot project would take five years, starting from November 1989, but financing has only been extended till November 1993.

8.1 **Institutional Changes**

Kiosk committees

Management committees were formed in early 1990 at all public water kiosks constructed by the WSEP. Problems that were encountered at the kiosks were solved by the committees themselves with only minimal assistance from the staff of NUWC. From May 1990 onwards, meetings of the individual committees with a NUWC staff member (allocated as the liaison person with the committees) took place in which problems concerning water supply were discussed and disputes within the committee were settled. One public meeting was organized with the local municipal authorities, where representatives of all the committees were present. This meeting was to reiterate the need for proper management and efficient cash collection at the kiosks and to encourage the committees to continue their work. At the same time it was to involve local municipal authorities in the provision of water for the population. In the last quarter of 1990, kiosk regulations and agreements were introduced. Coupled with regular meetings of the committees with a NUWC representative, this improved the feedback from committees to the corporation during the next year of the project.

Advisory board

Initial moves were made for the establishment of a Water Board for Nyala. This board should be a forum for discussion and the body through which the water resources of the wadi Nyala would be managed and its utilization would be planned. The board would be composed of members of the public as well as industrial and agricultural users and would represent their interest and views. In July and September 1990, meetings with municipal authorities were held and the formation of a "Water Resources Advisory Board" was approved by NUWC Headquarters in the first half of 1991. This advisory board, however, was never installed because in late 1991 two alternative "platforms" were already formed: a "Public Services Committee", which would discuss issues concerning water and other public services, and a "Technical Committee" on water resources issues in Nyala.

Enterprise Development Plan

The first mid-term review mission of the Dutch Government in May-June 1990, recommended that the water supply to the towns of Nyala and El Geneina should be by a private water supply company. This was, to a certain extent, in line with

the policies of the Sudanese Government and the International Monetary Fund, which were discussing possibilities of privatization of many publicly owned corporations. A discussion paper was prepared on this subject. Further consideration and investigations in the first half of 1991, led to the conclusion that privatization of NUWC Nyala would be premature. The economy of the Sudan was very weak, and the private sector ill-developed and inexperienced in the provision of these kind of services. Instead of full privatization, an "Enterprise Development Plan" (EDP) was prepared which outlined a path towards greater autonomy and operational freedom of the NUWC Nyala. This EDP aimed at a situation whereby NUWC Nyala would be self-financing within three to four years. The EDP fitted well with the aims of federalism and greater state financial independence, which were pursued by the Government of the Sudan from February 1991 onwards

Planning and communication

Proposals for a public/customers relations post which would handle customer queries and complaints, as well as a general plan for a planning unit, were developed but not implemented. These proposals have constantly been brought to the attention of the management, but as so few of the top management posts have actually been occupied during the latter part of the project, little progress was made.

8.2 Management Development

From April 1991 onwards, the kiosk management committees started replacing broken taps and doing minor repairs. Some committees levied a small surcharge for the purchase of taps and for repairs. Committees also became more responsible for the infrastructure associated with the kiosks. They insisted for example on the installation of lockable inspection lids at the valve chambers. Waste water drainage improved and the waste water was collected in pits and sold for animals.

Monthly management meetings

Management Team Meetings (MTMs) were attended by the heads of departments from the beginning of 1990, in which reports of past progress were presented and plans for the next weeks work were discussed. During these meetings, the heads of departments generated a greater understanding of the need for regular meetings and for better communications between them. After some months, however, the management meetings became less frequent. They were replaced by a regular set of meetings between the chief water engineer and individual senior staff from each department. Only towards the end of the project were the monthly management meetings reinstated

Annual operational plans	The idea of an Annual Operational Plan (AOP) was developed: a document that would set out targets and resources that would be required to meet these targets within a realistic time-frame. A set-up for a AOP was ready by the end of 1991 but, although many of the targets set in the AOP were discussed and finally implemented, the document itself never got sufficient attention from the management.
Management information system	In his mission of May-June 1990, the financial expert noticed that although information was available, different data could not be brought together. Therefore, management was not able to make the most appropriate decisions. He recommended that NUWC Nyala should introduce a more integrated Management Information System (MIS) based on commercial accounting. As a result MIS sheets were developed and used to provide some basic management information that was easily read. These sheets could give managers comparative information over a period of time, on which to judge performance of the various sections (see Annexes C and D). From the beginning of 1992, these MIS sheets have been completely filled in and a good overview for 1992 and most of 1993 could be established in annual summaries. In El Geneina, questionnaires were developed in order to monitor water use patterns in kiosk and non-kiosk areas.

8.3 Financial Autonomy and Independence of the Urban Centres

The intention of the ISMD pilot project was to retain the revenue generated in the two towns of Nyala and El Geneina in a separate account so as to prevent remitting it to NUWC El Fasher or Khartoum. This proved to be more than optimistic as, by the beginning of 1990, the revenue from Nyala was subsidizing the operations of the NUWC in El Fasher. However, it was agreed that the income generated by the WSEP kiosks could be retained in a separate account so that this money would remain in the urban centre itself. The revenues from operations in El Geneina could not be deposited into a separate account due to the fact that there was not a sufficiently senior staff member who could manage the account.

Cross subsidization	The issues of the bank account for Nyala and also the problem of access to funds were discussed with Headquarters in September 1990. However, there seemed to be no solution to this problem, as cross-subsidization from Nyala to El Fasher was still practised and any reform in use and allocation of funds had to be approved by the regional and national levels.
Nyala able to finance itself	In May-June 1990, the first review mission of the Dutch Government concluded that for the coming year NUWC

would be able to finance 95% of the budget by its own income through increasing revenue collection. Also, with effective leakage repair and control, the amount of unaccounted water could be reduced, thus improving revenue collection and reducing shortage of water. The mission expected that, within three or four years, NUWC Nyala could be self-financing. The Project Economist who visited the project during the first two weeks of June 1991, came to similar conclusions: the Nyala operations could become self-financing up to recurrent cost recovery within 1½ years, and full cost recovery could be reached towards the end of 1994.

Transfers-out should be well recorded

Continuously since August 1992, the NUWC operations in Nyala have been able to cover recurrent costs from locally generated water charges. By the end of the project in November 1993, the current surplus was sufficient to cover reservations for electricity (though the National Electricity Corporation still does not bill NUWC), pump and other equipment replacement. This happened in spite of the fact that most government institutions still only pay a small fraction of their bills. However, the surpluses accumulated in bank accounts as reserves are being redistributed by the state director's office to other Darfur towns. Even the above-mentioned special account for exclusive use in Nyala has been unilaterally eliminated by the same office. It is now of the utmost importance that Nyala keeps good track of the "transfers-out", so as to claim this money back when needed for equipment replacement.

House survey

From the second half of 1991, a survey and updating of the records of private house connections was started to detect illegal water connections. Bicycles for this purpose were provided by the project. Data collection forms were designed and the meter section staff were trained in their use. In Nyala, more than 5,000 houses have been checked and a small number of illegal connections registered. As this work was interrupted several times, not all houses had been visited until the end of 1992. In El Geneina 1,200 house connections were counted. All the houses in Nyala and El Geneina have been renumbered with paint and the meter or delivery size was checked and recorded. Cross-referencing to the accounts department was not completed till 1993.

Double-entry commercial bookkeeping system

In 1990 an Accounts and Financial Advisor was in Nyala for a two-week mission. According to his recommendation, a simple format for the presentation of financial data, to be used for decision-making by management, was prepared in July 1990 (see Annexes C and D). A double-entry commercial bookkeeping system was to be introduced, starting on 1 July 1991. This introduction was preceded by a course in Nyala on this type of accounting, in which about 20 accountants from different towns have participated. In June,

the proposal from the Khartoum-based MDC for their consultancy inputs to the accounts department, was finished. After some amendments, a revised version of the proposal was submitted to the project in mid-August. The consultancy could not, however, be carried out because the consultancy staff appeared to be unavailable. In the autumn of 1992, new efforts were made to arrange for consultancy to assist the accountants with the introduction. Negotiations started again with MDC and another national consultant was granted the contract. Also this firm had difficulties in forming a team but, in April 1993, the introduction was started by a short accounting refresher course. With some interruptions, this introductory consultancy continued till November of that year. By that time the new accounting system had been quite well introduced and integrated, due mainly to some adjustments made in the accounting staff.

Accounting manual still under preparation

Unfortunately the local consultant has not yet been able to present an acceptable version of a customized accounting manual which covers all aspects of introducing this system.

8.4 Revenue Collection

Wider application of flat rate tariff

Because the number of meters that were not functioning was so large and their replacement cost would be exorbitant, new tariffs for private house connections were introduced early in 1990. These were not based on metered consumption, but on the size of pipe that delivers water to the house. Where meters were operational, the metered rate would be charged.

Weekly collection from kiosks

A new system of revenue collection at kiosks was introduced: instead of daily collection from kiosks, collection by the NUWC cashier would take place only once a week. Kiosk committees were thus made responsible for the kiosk revenue of one week, instead of one day.

Measuring kiosk consumption

Methods of cross-checking the amount of water delivered to the kiosks and the amount of revenue collected were instituted and staff was trained in the calculations. Collection forms were developed and regular meter reading was done at the meters that had been installed at some kiosks. During mid-1990, however, it was discovered that the water meters that were installed at each of the kiosks were giving inaccurate readings. This was caused by airflow as the pipelines were emptied each day when the pumping had ended. When pumping started the following day, the air pushed through the pipe had the same effect as water and was recorded. The system of recording and checking of water delivered against income was therefore considered of little use and the system was temporarily suspended. In the last

quarter of 1991, two bulk meters were installed to measure the water supplied to six kiosks.

Many community kiosks now individually metered

The amount of water supplied to these kiosks could now be metered exactly and the theoretical income calculated. In meetings with the kiosk committees, it was agreed that any deficit in revenue collection had to be compensated by the kiosk committees themselves. In the following weeks, a considerable increase in revenue collection was measured. It is important that the kiosk committees know that the water consumption can be and is checked. In 1993, it was found that another type of meter did not have the drawback of also measuring airflow. Many of these meters have been installed in kiosks (there were not enough for all kiosks), which enables the NUWC in Nyala to closely monitor the real consumption of most kiosks.

All old kiosks metered

All twelve concessionaire kiosks in Nyala (one has been added in mid-1993) now have good working meters and invoicing these kiosks correctly no longer poses a problem.

Government institutions contribute little

Government institutions are still paying a small share of the fees that are invoiced to them. Invoicing these institutions was problematic till about September of 1993 as the consumer accounts section had not been able to provide monthly bills. Even when accurate and timely billings were submitted, these consumers still only paid 10% to 20% of their billed charges. For Nyala NUWC operations, this represents a monthly shortfall in income from these institutions of approximately £S 1.5 million. Nyala's income position would improve dramatically if these institutions could be better disciplined and the penalty of disconnection could be enforced.

8.5 Rehabilitation of Old Kiosks

Some old kiosks rehabilitated

Results of a survey revealed that revenue collection from concessionaire kiosks was far too low, mainly due to reluctance of the concessionaires to pay. Therefore, NUWC intended to take over the management of the concessionaire kiosks. In order to be able to provide an improved service to the public, rehabilitation of these kiosks was necessary. This was to be done according to an adapted design from the WSEP kiosks and the old type of kiosks. It was decided that locally generated funds from the kiosk account would be used, as the chance of obtaining funds from NUWC Headquarters was very small. In the first half of 1991, a survey of old non-operational kiosks in Nyala was undertaken by the pipeline section. Five kiosks were selected based on a set of criteria that included:

- state of repair;

- existence of newly installed private connections in the area served originally by the kiosk;
- demand for, and cost of, water in the area bought from water vendors;
- cost of rehabilitation

Because the money of the kiosk account that would be used for rehabilitation was spent on other purposes, the rehabilitation programme was delayed. By the end 1991, only two kiosks were rehabilitated and connected to the town network, and one new kiosk was constructed. By 1992, eleven, out of the original 22 concessionaire kiosks, were still in operation. Most of the other old kiosks have been dismantled and one new kiosk has been opened near the hospital, especially to fill vendors' carts.

8.6 Infrastructure, Materials Management and Logistics

Operating manuals

Operating manuals for pumps and pipelines were to be made for efficient management of NUWC's physical plant. For this purpose, technical assistance was needed because the knowledge and the time for their preparation were not available from the project itself. Late in 1991, a consultant from NUWC Khartoum (NUWC Director of Operations and Maintenance) prepared a set of three Standard Operational Procedure manuals, concerning:

- operation and maintenance of booster pumps;
- operation and maintenance of submersible pumps and boreholes;
- pipeline operation and repair.

Training was undertaken in the use of two of these manuals in the everyday work situation.

Permanent NUWC attention for community kiosks

The pipeline section of the NUWC operations in Nyala appointed a staff member to inspect daily the new kiosks and to undertake repairs as they were required. Tools and spare taps were bought so that broken taps and leaks could be repaired immediately thereby providing a minimum of wastage.

Outfitting of offices and workshops

Purchases were done for the accounts and administration section: filing cabinets and hanging files were purchased for keeping personnel records. More calculators were supplied to the accounts staff. According to the recommendations of the Accounting and Financial Advisor, the layout of the accounts office was improved and old records were stored elsewhere. A new personnel office was constructed and equipment purchased. The project provided funds for the purchase of roofing sheets for this office. Other purchases were bicycles for the meter reading section and workshop equipment. In 1992 and 1993, ISMDP provided the NUWC branches in Nyala, El Fasher and El Geneina with stencil duplicators,

mechanical typewriters, electronic calculators, pipeline tools, garage equipment and tools. At the end of WSEP/ISMDP, it has transferred all except one of its vehicles, its short-wave radios, its photocopier and all remaining office equipment and supplies.

An investigation was undertaken late in 1990 on the installation of alternative tanker filling points, because it was felt that more delivery points were needed. By then there was only one point where tankers could collect water. A second point was installed by the ISMD project on the same site which greatly enhanced the speed and efficiency of collection and delivery

8.7 Manpower and Staff Issues

Job descriptions and personnel evaluation forms

Job descriptions and schemes of services for 61 posts in Nyala were completed late 1990. Simplification and rationalization of the number of job titles still had to be undertaken. By 1992, the job descriptions have been evaluated and most had to be rewritten. By then ISMDP also developed a personnel evaluation form, to be filled in for every employee and regularly updated. However, personnel evaluations must be filled in objectively to be useful and this clearly appeared to clash with the local tradition and standards of respect.

New kiosks could not be handled by NUWC staff

Daily paid staff was employed for three or four months in 1990 to count the revenue collected from the newly installed kiosks. In July 1990, they had to be laid off because they were not permitted to handle money on behalf of the NUWC and also because the numbers of daily paid staff had increased too sharply. Eventually the collection of revenue from the kiosks was undertaken on a weekly basis. This considerably reduced the time spent by corporation staff on this activity and thus reduced the need for daily-paid staff.

Management team not complete

In Nyala the top management team, consisting of the chief water engineer, water engineer, inspector of accounts and manager of support services, has been permanently and seriously short staffed. During much of 1992 and 1993, only one of the four has been present and there have been prolonged periods with none of the four working in Nyala. It is obvious that the effectiveness of ISMDP has been seriously disrupted and bringing this to the attention of the higher officers has had only little, or no lasting, effect.

In El Geneina staff shortages that were encountered during the WSEP, were still not solved. The lack of a senior staff member of engineer rank who has overall responsibility for the operations hampered the efficient operations in the town.

In mid-June 1990, a new resident water engineer was finally posted to El Geneina.

Training needs assessed

Recommendations concerning training needs were made by Euroconsult's human resources specialist in October 1991 and November 1992. One of the recommendations was that there should be an exchange of staff between urban centres in Darfur and other states, whereby the staff can see how operations in other NUWC centres function and as such can learn from each others experience. Virtually all training recommendations made by the human resources specialist, and some additional training, have been carried out

Many staff have been trained

Training courses and seminars:

- In April 1990, the Director of the Planning Department at NUWC Headquarters attended the international conference on "Water and Wastewater" in Barcelona
- English lessons were given to NUWC staff in Nyala during 1990 (on a voluntary basis by the wife of the Project Coordinator).
- The chief water engineer Nyala attended a management training course in October 1990 at the University of Khartoum.
- The state director of NUWC Darfur attended the one-month "Management for Sustainability in Water Projects" course at the Management Development Foundation (MDF) in Ede, the Netherlands, in November/December 1990.
- Four pump mechanics, fifteen pipefitters and four electricians attended training courses at the Technical High School (THS) in Nyala, in May 1991 The programme lasted from four to six weeks with the staff attending two sessions of two hours per week.
- As the programmes at the THS had not been completed, the courses have been continued in 1992 for the pipefitters and electricians, but now with six sessions per week and three hours per day.
- An accounts staff training (24 accountants from El Geneina, Nyala, El Fasher and Khartoum) was held during April and May 1991 at MDC in Khartoum. In April 1993, a one-week full-time refresher course has been organized in Nyala, attended by 18 accountants from Nyala, Fasher and Zalingei.
- During the installation of new booster pumps and the electrical switch gear in the pump house, two technical experts were able to provide some on-the-job-training.
- In 1991, a course on human resource management was attended by the Personnel Manager at the MDC in Khartoum
- In 1992 and 1993, about 30 higher staff members of all Darfur towns have been trained in a large variety of courses at MDC in Khartoum.

- In 1993, two assistant car mechanics received a four-month full-time training at the Ministry of Labour/ILO vocational training centre in Nyala
- Also in 1993, the chief of Nyala's purchasing and stores section got a 3½-month training at the Khartoum Supply Officers Institute
- A training visit of Nyala's chief water engineer at the Ismaelia Water Works in Egypt could not take place because of the strained relations between Egypt and the Sudan.

8.8 Health Aspects

Health education in El Geneina

A Health Education Support Programme (HESP) was started in El Geneina in January 1990. The Irish private voluntary organization, GOAL, implemented this programme. A training of community motivators was conducted in three separate courses during January, March and May of that year. A total of 86 people, selected from the ten kiosks in El Geneina, have been trained. A course for 26 primary school teachers was held in January 1990 and a second one in June. During these courses, flip-charts were used which were supplied by the project. Teaching at the kiosks took place during evening sessions. Audio equipment and photographic material on a variety of topics such as water storage and water use at home, water-related diseases and water collection and transport, were supporting these sessions. In September 1990, the team of GOAL was evacuated from El Geneina because of the security situation. The local counterparts continued the work, with the emphasis on linkages with schools. Transfer of the training programme to Nyala was discussed with the Ministry of Health's Environmental Section in Nyala. This programme, however, had to be carried out by an NGO and should not be under the responsibility of the ISMD project, which could play a monitoring role only. During the ISMDP, however, no health programme was undertaken in Nyala.

Waste disposal problems

A proposal was formulated for a project intervention that would provide better disposal of solid waste. This was considered to be necessary as solid household waste disposal, with middens or rubbish heaps scattered throughout the towns, constituted a serious health hazard for the inhabitants. Late in 1991, discussions were held with the municipal authorities in Nyala on the provision of a solid waste disposal service. The project did not develop any further activities in this field as these had been assumed by the Water Resources Management Committee.



Improved Service Levels



Improved Hygiene - Improved Health

9 THE IMPACT ON SERVICE LEVELS AND ACCESS TO SERVICES

Before the WSEP started in Nyala and El Geneina, people had four different ways of obtaining water:

- private house connections
- water vendors
- dug wells
- a limited number of concessionaire managed kiosks.

House connections were only available in the centre of the towns as far as NUWC's distribution network reached. People living in the areas around the centres or in the scattered settlements on the outskirts of the towns, were dependent on *water vendors* who delivered water to the houses, using horse- or donkey-drawn carts. These water vendors got their water either from NUWC kiosks, operated by *concessionaires*, or from private wells. As the water they sold was expensive, people often tried to take their water from *dug wells*. In some cases, they were forced to walk long distances in order to reach these wells. Water from dug wells and donkey vendors was often of poor quality.

Kiosks for as many people as possible

The WSEP aimed at supplying the more permanent inhabitants of the areas around the centre with safe and relatively cheap drinking water. Extension of the house connections, which normally would be the best solution, could only reach a limited number of people as the available water resources in Nyala and El Geneina were limited. Therefore, a system of *water kiosks* was chosen so that as many people as possible could benefit

9.1 Different Service Levels

At present, the NUWC's distribution networks in Nyala and El Geneina serve different users or user groups.

House connections

The town network in Nyala has 5,538 house connections, which serve about 50,000 people. Other consumers are 143 government institutions, such as schools, a hospital, the military and the town council. In El Geneina, there are 1,226 house connections. During the WSEP a rehabilitation programme was carried out for the town networks in which some pipeline diameters were enlarged, valves were replaced and leakages repaired. This resulted in a more reliable water supply to house connections. However, weak points in the distribution system remained, as pipelines were not well maintained. Moreover, pipes were laid too close to the surface and therefore were exposed to traffic and weather conditions. One-third of the connections, mainly those in Nyala North, receive no water during part of the year. An

improvement programme for this area was proposed by ISMDP but was not implemented.

Tanker filling point

In Nyala, there is one tanker filling point, connected to the town network, that supplies water to tankers from different institutions like the town council, industries, livestock departments and the roads and bridges corporation. Before filling the tanker, the bill has to be paid to the water corporation. The note received is to be delivered to the guards at the tanker filling point. After that, the tanker is filled by using a hose. Plans for constructing more tanker filling points, that would also be accessible for water vendors were not implemented.

Concessionaire kiosks

In Nyala, twelve NUWC kiosks are operated by concessionaires. In most cases, private citizens operate these kiosks as a private enterprise. Eight of them sell water to vendors with carts. In the past, concessionaires used to pay to NUWC a fixed fee based on an estimation which was far less than the actual amount consumed. During the ISMDP, water meters were installed and now official tariffs are applied which results in more accurate billing. The ISMDP planned to rehabilitate the concessionaire kiosks, on the one hand to improve service to the public and on the other hand to increase the income of the water corporation. Only two of the old kiosks were actually rehabilitated and handed over to a kiosk committee (see next paragraph). Of the original 22 concessionary kiosks, ten have been dismantled as there was no further demand for their services. Two out of twelve concessionaire kiosks are at present operated by a committee. A representative of such a committee collects money from kiosk customers, who sell that water from jerry-cans elsewhere in town. In El Geneina, ten kiosks used to be operated as concessionaire kiosks but at present all are deserted. Either no water reached these kiosks, or bad paying habits of concessionaires forced the water corporation to close them down.

Community kiosks

The first community-operated kiosks were constructed by the WSEP in 1988. They serve about 50,000 people living in the northern and southern parts of Nyala. This figure represents about 10% of the total population of Nyala. The new kiosks for the eastern and western parts of Nyala, which are still under construction, will provide another 50,000 people with water.

The water kiosks in El Geneina serve 16,000 inhabitants.

9.2 Supply Through Community Kiosks

Opening hours

The water distributed to the community kiosks comes from booster pumps at the NUWC compound. Every morning

between 8.00 and 12 00, the pumps are operated so that water can reach the taps.

Only the new community kiosks in hai El Jebel/Taiba will be supplied directly from the boreholes.

Consequently, the community kiosks are operated during four hours of the day. In the first years of operation, the kiosks were open for only three hours a day and were closed on Fridays and holidays. The opening hours have increased after many users complained about the limited availability of water.

During the first years of operation, the water supply to kiosks was very irregular, especially at the end of the dry season when the usable water resources were almost exhausted. Kiosks sometimes got water for only half an hour and people had to wait for hours in front of the kiosk. Sometimes they did not even get water before the kiosk closed. Irregularities in the pumping schedule were due to the unreliable power supply, lack of fuel (El Geneina) and damage caused by lightning or flooding. Only after the three eastern boreholes in Nyala were put into operation in April 1993, the water supply to kiosks and the town network became regular, even during the end of the dry season (May and June).

Tariffs

The water is sold to the users per unit of two jerry-cans. Before entering the kiosk, people pay £S 2.00 per unit to the kiosk minder. The jerry-cans have a standard size of 4.5 gallons (= about 20 litres) each. Although the amount of £S 2.00 is higher than for private connections, the price is still very low compared to prices charged by vendors and has not been a constraint to consumption and is not experienced as an obstacle to buying water.

Walking distance

A survey carried out in 1991 showed that most kiosk users live close to the kiosks. Only 25%, however, have to walk 16 minutes or more. 94% of the users always use the same kiosk. Most of them (82%) visit their kiosk more than once a day.

9.3 Water Vendors

Water vendors still supply most people

In October 1992, a survey was undertaken by the town council in order to count the number of water vendors in Nyala. The survey estimated that about 2,000 water vendors with donkey and horse carts were operating in the town. In view of the fact that the house connections and the community kiosks serve about 150,000 persons, and that Nyala by then had a total population of at least 450,000,

water vendors supply up to 300,000 inhabitants. They are still the main suppliers of water in Nyala, especially for people living in the low-income areas on the outskirts of the town.

About 35% to 40% of the water vendors take their water from concessionaire kiosks. Others get it from private dug wells, scattered all over town but especially numerous in and along the wadi Nyala. These unprotected sources of water give water of doubtful quality. Moreover, water vendors ask high prices which limits the amount of water that low-income people can afford. Prices are sometimes ten times higher than at the kiosk. Vendor water has the advantage that it is delivered to the customer's door.

As so many people were still dependent on water vendors, it was proposed by the ISMDP to construct filling points in Nyala that would be exclusively used by water vendors. Thus the travel time from collection to selling point would be reduced, resulting in potentially lower prices for the poorest people. This proposal was never carried out because there was no guarantee that water vendors would really lower their prices.

Because water vendors in El Geneina move water in limited quantities (they use goat skin bags of 4-5 jerry-cans), they are allowed to take it from community kiosks. This has a positive effect on the quality of water sold by vendors in El Geneina.

9.4 Demand for Water

Water consumption

In September 1991 a survey was carried out in Nyala to determine the demand for water among the users of community kiosks and/or water vendors. This survey showed that households which got water from kiosks and/or vendors consume on average about 150 litres each day. This amount includes water for all purposes: drinking, domestic use, gardening and livestock. Considering that one household consists of on average seven people, the amount of water consumed per person was about 21 litres/day, of which 8.5 litres for drinking.

Although water from kiosks was much cheaper than that from vendors, the survey showed that vendor clients consumed 15% more water than kiosk users did. Reasons for this finding were that the kiosks at that time did not sell on Fridays, pumping hours were limited, and kiosks did not always operate according to schedule. Most of the households that got their water primarily from kiosks were therefore sometimes forced to buy water from vendors as well. This was not always possible as water vendors tended to be

reluctant to sell water to kiosk users. All of the respondents wanted the opening hours of the kiosks to be longer.

Expenditure on water

The survey also showed.

- Kiosk users spend about 1% of their household expenses (food, fuel and water) on water.
- Water vendor customers appeared to spend 25% of their expenses on water, and at the same time spend 35% less on food and fuel. Because family size and income class of both groups were similar, it was assumed that the water expenditures affected the amount of money that was left for food and fuel.
- 84% of the people said that the price charged for the water at kiosks is "fair", "cheap" or even "very cheap". Only 16% were of the opinion that the price is "expensive" or "much too expensive".
- 91% of the respondents were willing to pay a higher price (twice the current rate or even more) for water, if this would reduce the waiting times at the kiosks!

Survey recommendations

The survey led to the following conclusions:

- the demand for water was still not satisfied,
- the demand for water is inelastic (varies little at different price levels)⁶.

It was therefore recommended to increase the number of pumping hours. Moreover, the inelasticity of the demand would enable the NUWC to recover full costs in the future.

9.5 Health Aspects

Quality of water (supply side)

The water which comes from the wadi Nyala is filtered through the wadi sand. This ensures rather safe drinking water during most of the year. At the onset of the rainy season, water from shallow boreholes that have been nearly dry has little time to be filtered before it is pumped into the network. Moreover, NUWC Nyala operates two open wells near the market and refuse heaps in the wadi itself. During several weeks, these shallow wells and other boreholes in this area could possibly deliver contaminated water to the network, giving rise to serious health hazards for the inhabitants. Recommendations not to use the shallow boreholes at the start of the rainy season were until now ignored by the water corporation.

Before the WSEP kiosks became operational, some chlorination was applied to increase the safety of the water.

⁶ Which was claimed earlier by S Cairncross and J Kinnear in *Measurement of the Elasticity of Domestic Water Demand, a study of water vendors and their clients in urban Sudan*, London School for Hygiene and Tropical Medicine, Mimeo, 1989.

This system proved not to be a proper solution as the chlorine was not evenly distributed. The WSEP had proposed to chlorinate kiosk water just before it would leave the tanks. After samples, taken by the NUWC in El Fasher, indicated that water quality was adequate during most of the year, this proposal was not further elaborated.

Use of water (consumer side)

The way water is used by the inhabitants of Nyala and El Geneina is generally not very hygienic. Existing practices cause serious health risks and a majority of illnesses are directly or indirectly linked to water (e.g. diarrhoea, dysentery and hepatitis). These practices include: drinking contaminated water, eating food that is inadequately washed with clean water, inadequate personal hygiene/washing, walking in pools of infested water. Without changing these practices, the effects of supplying clean and safe water are minimal.

As water from kiosks is often used in combination with water from water vendors, the effect of clean kiosk water on improving health conditions will be limited unless people understand that they should reserve kiosk water for drinking purposes, and use vendor water for washing and cleaning purposes.

Health education in El Geneina

In 1990, a Health Education Support Programme (HESP) was carried out by the Irish NGO, GOAL, as a component of the ISMDP. The purpose of the programme was to make people aware of the importance of health conditions at the kiosk site as well as in their homes.

Health education at the kiosks in El Geneina began in June 1989, after a survey had been carried out to determine community knowledge and attitudes regarding basic health matters. The Health Education Support Programme in El Geneina started in January 1990 and lasted until November 1990. Health education methods used at kiosks were: slide shows, role plays, demonstrations and discussions. Furthermore, 86 community motivators were trained during three training courses. These community motivators would give health education at kiosks and during home visits. Also, 26 schoolteachers have been trained and health education materials developed.

The HESP in El Geneina was too short to have a serious and sustainable impact on attitudes and behaviour of water users. The HESP was not conducted in Nyala because GOAL was evacuated from the area during the Gulf war and no other suitable NGO could be found to implement the programme.

9.6 The Effects

More water and more frequently available

The interventions of the WSEP and ISMDP have resulted in an improved service level to the public by the NUWCs in Nyala and El Geneina.

Thanks to the projects, houses with water connections receive a much better service than before. While dry season supply has been very poor recently, since 1993, there is no longer a reduced supply during that season in Nyala. The water pressure at the end of the distribution network has also increased so those consumers are now much better served. However, some people with private connections are still getting irregular supply. Moreover, only a small part of the population (about 50,000 in Nyala and 20,000 in El Geneina) benefit from the advantages of having a house connection (in convenience and price).

Cheap water close to the homes

The newly constructed community kiosks furnish cheap water to the houses. Committees take care of water wastage and health conditions at the kiosk site. A disadvantage of this supply system is that opening hours are limited. Besides the supply to house connections, kiosk water supply is also sometimes irregular due to electricity cuts or water shortage at the end of the dry season. In Nyala, the situation has improved considerably in 1993.

Water vendor filling points

Most people in low-income areas are still dependent on expensive and sometimes poor quality water from vendors. More water vendor filling points could help to solve the quality problem and are strongly recommended, though end-user prices are difficult to control.

Health education has to complement clean water

The effect of the project interventions on health conditions is thought to be limited. On the supply side, the piped water supply is generally of better quality although bad quality water is delivered to some parts of the town during the rainy season. On the consumer side, water usage practices as well as the combined use of kiosk water with vendor water, reduce the effect of a safe water supply. Furthermore, the availability of cheap kiosk water does not mean that more water was bought. Kiosk customers, however, could spend more money on food, fuel and other household items. Although it was explicitly mentioned in the project proposals that health education was not to be carried out by the ISMDP itself, integration of this component in the project would probably have resulted in more continuous activity in this field with a greater impact on health conditions.



Sometimes There Will Be Breakdowns...



Quicker and More Efficient Response to Breakdowns

10 CONSTRAINTS TO DEVELOPMENT

10.1 Why Construction Was Slow

There were several reasons for the slow progress of the construction project.

Non-availability of funds

Delays in the construction works were mainly caused by shortage of local funds. Without money, no casual labourers could be hired for trenching and pipe-laying, no purchases could be made or contracts signed. As no local project funds were released, the work could not start before February 1987.

It took the resident engineer two months in Khartoum to bring about the first release of allocated funds. Finally, it was agreed with NUWC Headquarters that a project account would be opened for project funds, on the condition that the money would only be made available in monthly advances. Data on all expenditures made by the project had to be sent to Khartoum and approved by Headquarters and the Ministry of Finance and Planning, before new advances would be released (see Chapter 2).

This meant long waiting times for each advance: data had to be collected, sent to Khartoum, and pass through the different departments within NUWC Headquarters and the Ministry of Finance.

Shortage of staff and casual labourers

Progress was also hampered by a continuous shortage of project staff. The resident engineer was responsible for both Nyala and El Geneina. For each town, only four labourers were supplied by the NUWC: three pipe fitters and one foreman. Under pressure of the resident engineer and the Dutch embassy, the NUWC finally appointed nine pipe fitters, one supervisor for El Geneina and two foremen, and later an assistant resident engineer for El Geneina and a mechanical engineer for Nyala. Two more junior engineers and one more supervisor were still needed for a proper execution of the work.

Furthermore, it was very difficult to attract casual labourers because government wage rates were well below current market rates.

Rocky soil conditions

Trenching for the main line of Nyala's hai El Wahda took much more time than planned because of the rocky soil. Manual removal of rock outcrops is a time-consuming activity. Therefore it was decided to wait for suitable drilling equipment (an air compressor with jackhammers) which had to come from the Netherlands. Excavation could only resume by the middle of 1988.

**Transportation
delays/restrictions on
purchasing**

The cement that was purchased in Khartoum did not arrive on time in Nyala, thus causing delays in the construction of buildings, elevated tanks and kiosks. The local NUWCs were not allowed to buy cement locally. An answer to this problem was found by building kiosks in which more brickwork and less concrete was required.

10.2 Lessons Learned

The construction of kiosk extensions took all together far more time than was planned. Although the kiosks were meant to relieve the emergency situation for as many people as possible, it has taken more than seven years before 90% of the target group could be supplied with water close to their home. The emergency situation gave preference to "quick" solutions and execution of works started before even preliminary designs and research were finished.

There are various reasons for the slow progress of the construction project. The non-availability of Sudanese funds at local level is probably the most important. Bureaucratic procedures (within NUWC and the Ministry of Finance) make the release of money problematic and time-consuming.

Other constraints have been the underskilled project staff who were provided to assist the resident engineer in implementing the project, lack of skilled labourers, the non-availability of casual labourers, and the long inland transit times for materials from abroad.

**What future projects
should consider**

It is safe to assume that the experiences of the WSEP in Nyala and El Geneina can serve as lessons for developing and implementing similar projects elsewhere in the Sudan. If any similar construction project at local level is to be successful, the following recommendations have to be taken into account.

Access to project funds

A different system should be found for the reimbursement of national project funds. The distance between funding agency and the users of the funds should be kept as short as possible. In this way, the chance of losses and delays in the different stages of the process, can be reduced.

One option could be placing the money on a separate project account, hence avoiding delays caused by the procedures within the Ministry of Finance. Thus, it is possible to take money directly from the account whenever it is needed.

When the project set-up requires involvement of the Ministry of Finance, and project payments are to be made by advance payments, these advances should be released for a longer period, for example for half a year.

To avoid delays in sending, or in losses of financial data on expenditures, it is advisable to send an auditor from NUWC

Headquarters to the project site so as to assess the progress and control the expenditures. This auditor should be authorized to approve the release of the next advance.

Project staff

Enough national project staff should be allocated *before* the project starts and enough technically skilled labourers, such as pipe fitters, mechanics, electricians, have to be made available. To follow up the ordering, transportation and customs-clearing of materials, as well as the financial procedures, a logistics officer stationed in Khartoum is very important. Before implementing the project, an assessment should be made of the staff that is necessary during the different stages of the project. The staff should then be allocated according to this schedule.

Reduce waiting times for goods

Long waiting times for transportation of goods do not have to become a problem when appropriate planning is made. During the time of tendering, ordering, procurement, shipment and transportation, only the logistic office, one consultant and his counterpart, and one person of the funding agency should be involved. The rest of the project team can be mobilized after materials have arrived on location.

Freedom to pay market rates

Problems in paying market prices for casual labourers and local goods, and restrictions concerning purchases above £S 10,000, can be avoided by using contractors. A contractor is free to pay whatever wage level is required and to buy wherever he sees fit. When project implementation is not done by contractors but by the NUWC itself, exceptions should be made by the Ministry of Finance on these restrictive regulations

10.3 Bottlenecks to Institutional Change and Good Management

In 1988, a Dutch mid-term review mission recorded the poor performance of NUWC Nyala in operations and maintenance.

The mission concluded that:

- training of personnel requires improvement;
- key positions in the organization needed to be filled;
- maintenance needed improvement;
- a higher fee collection rate was required in order to meet operations and maintenance costs

These were also the main reasons why ISMDP has been brought into existence.

Community kiosks should pay better

The kiosk self-management by the community committees and kiosk minders is without doubt a great success. The only disappointing aspect is the rather low fee collection efficiency. Over long periods, the average efficiency is at best 70%. Once it drops to 60%, the NUWC starts making

disconnection threats and most often this is followed by a month with near perfect payments, after which the improvement peters out again. In El Geneina these percentages are even lower, but even in Nyala no method has been found that successfully sustains high collection efficiency.

Routine functions to be carried out on time

Technically it is rather easy to reach near perfect collection rates for house connections, concessionaire kiosks and commercial/industrial customers. The NUWC has the tool of disconnection and its success just depends on how well the branch is organized. If the consumer accounts section is behind with their books, one gets an even longer backlog in payments by customers. In Nyala, much of the arrears by government institutions have been caused by extremely late and irregular billing. However, even when these institutions are correctly billed, their payment records are very poor. It seems that only a well directed NUWC effort over many years will create a situation whereby normal payment discipline will be restored.

Management vacancies are limiting development

During the last few years, the Nyala accountants have been sometimes almost up-to-date with their work, only to lose this momentum and fall up to nine months behind. This could happen because an inspector of accounts has not been in function during most of 1992/1993 and the chief water engineer has also spent too little time in Nyala. Temporary replacements rarely make an effort to get involved in messy situations and even less to take corrective action. It is clear that management has to be present and everyone should know that management will take to action when required. If staff know management is interested in their work and following the work progress in all sections, backlogs will be minimal and unauthorized absenteeism reduced.

Management must be well informed and should take action

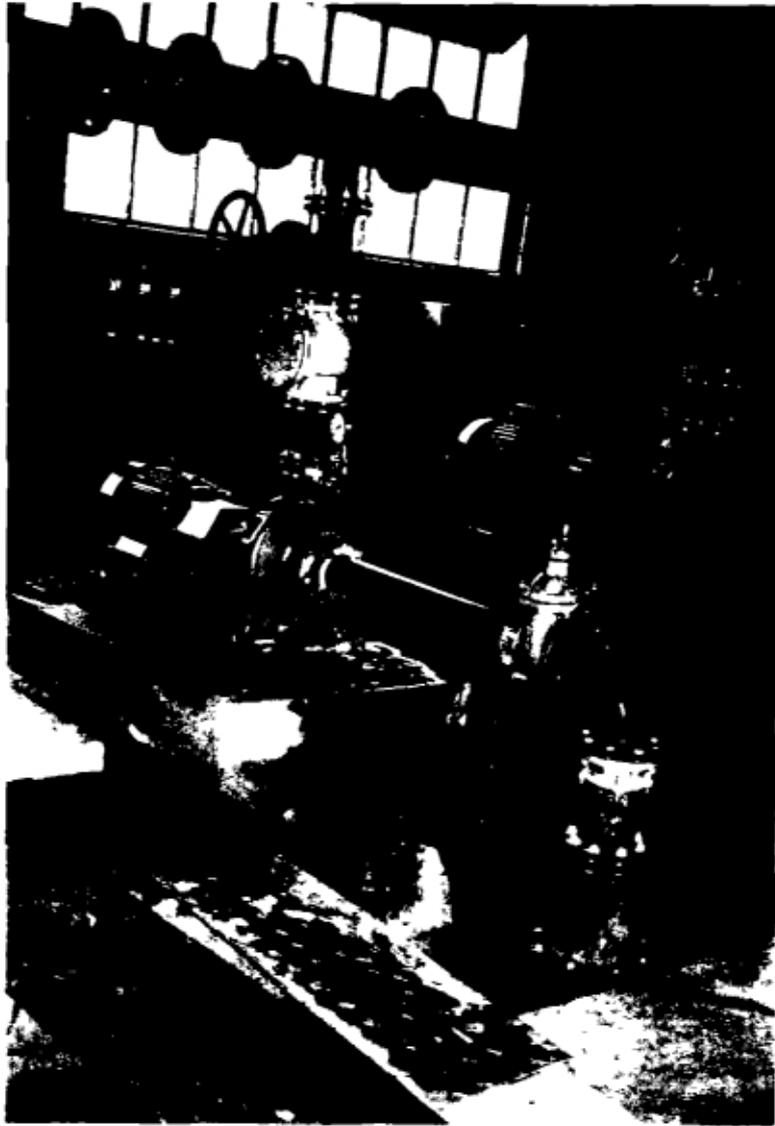
Management itself should set an example by being constantly aware of the work programmes and progress in the sections. No backlog, lack of tools, materials or staff should come as a surprise to management. Only then will the frequently used excuses will become ineffective and can disciplinary sanctions be readily applied.

Management should be sincerely interested

The genuine interest of management in the way work is done can also promote the introduction of new methods or techniques. It has been observed that very little of what has been taught in the courses, which are attended by so many staff, is actually applied.

Branch operations deserve proper attention from state office and Headquarters

Branch operations, such as Nyala and El Geneina, do not approach the state office or Headquarters very often for assistance. Their few requests are usually not very adequately met, whether this concerns material, advice, staff or administrative follow-up. Only money transfers usually arrive in time.



Can We Ensure Sustainability?



Planning for the Future...

11 **WHAT CAN CONTINUE TO BE IMPROVED WITHOUT FURTHER MAJOR ASSISTANCE?**

In this chapter, a number of possible improvements to NUWC operational efficiency are presented which can be introduced in towns that do not have access to the benefit of supplementary funding. The actions aimed at organizational and management improvement mentioned hereafter require very low or no extra cash outlays. Although the money input for these improved actions will be modest, the benefits for the towns and the local branches of NUWC can be considerable.

Management information sheets

In most towns there is very little information with which the managers make decisions. With the introduction of the Management Information Sheets, one takes the first step towards a systematic data collection system. One person in the branch office has to spend about two working days per month on the collection of these data which is to be provided by many sections or departments.

Results and benefits: Information becomes available to management for making timely and appropriate decisions and a series of these monthly management information sheets will provide an overview showing the effect of recently taken decisions.

Monthly management meetings

At least once a month, the general manager (chief water engineer) has to call a meeting with all the department and section chiefs to discuss the status and development of the branch operation. During this meeting the progress made in all sections is checked against tasks, targets and instructions. It goes without saying that the sectional tasks and performance targets first have to be described. During this meeting, the section chiefs can explain what bottlenecks have caused deviations from expected progress and plans can be prepared to get rid of these bottlenecks. During the meeting, at least some firm decision has to be taken on what to do next on a certain problem. This should result in either a further investigation or a new instruction to the chief of the section.

Results and benefits: Tasks will be defined and targets set. There will be an increased demand for better reporting and all the branch's operations systematically monitored. In combination with daily monitoring of the sections by the department heads, any constraints can be discovered and corrective measures taken at an early stage.

Simple organizational structure

The organizational structure of the NUWC in some towns is more complex than necessary. The functional units or sections should consist at least five staff and smaller ones should merge with another suitable one in the same professional area (to be distinguished into operations, financial or support services). Each section needs a capable

section chief to whom all staff in the section report. In smaller towns all section chiefs can report to the general manager (chief water engineer or water engineer). If the number of reporting section chiefs surpasses six, several sections in the same professional area can be grouped in a department, with a head of department supervising. The number of layers in the structure should not surpass three in branches of 60 people or less and not surpass four in branches up to 250 staff. Once these supervisory positions have been instituted, they have to be manned with capable staff.

Results and benefits: Short and clear reporting lines promote good communication and effective delegation of responsibility.

Sectional reporting forms

Sectional reporting forms force the chiefs of sections to inform the management on pre-determined aspects of the sections' activities. As a form is used, information on different months can be compared and trends followed and analysed. The forms as developed for Nyala can be copied and adjusted to fit other branch operations. The information collected through these forms can be seen as a second step providing management with data for making more informed decisions.

Results and benefits: With this tool, management is better able to check how well sections perform their tasks and achieve targets. Significant deviations are clear signs that management has to intervene.

Standard financial reporting

With formatted financial reporting, management is able to monitor the monetary situation of the branch. Particularly the revenue side should be monitored at least weekly so that action can be taken, if consumer payments are slowing down.
Results and benefits: If management is well informed on the financial situation of the corporation, it will be able to take actions and decisions in a timely manner.

Monthly transfer statement

Every branch office should produce a monthly money transfer statement in which all the money transferred to and from the NUWC branch is recorded. This statement should include the category "salary deduction not transferred". This comprises all the deductions which normally should be paid to Headquarters or the tax authorities, but are kept in the branch. The statement is also to include payments made by this branch for other branch operations and of course the payments made by other towns' NUWC branches, the state office or Headquarters for the benefit of this particular NUWC branch.

Results and benefits: This monthly statement is essential for understanding the money flows and explains the discrepancy between the monthly income-expenditure surplus (deficit) and the monthly cash/bank balance mutation. If a branch has

much of its surpluses drained off, it should use these statements to inform higher offices on the actual financial history of the branch.

Establish theoretical income level

After every tariff change, the branch should determine its theoretical income. The number of customers in every category is multiplied by the respective tariff and the amount for metered water as well as that for other charges to consumers is added in the sum total of theoretical income. The listing of private connections may need to be updated (as was the case in Nyala) and this may be a good occasion to mark all the houses, in the piped water areas, with a painted block/house number.

Results and benefits: The branch will know the maximum monthly income which it could receive when everyone is billed and pays these bills in full. The actual monthly revenue can thus easily be expressed as a percentage of the theoretical income and serve as a criterion to measure the effectiveness of those sections involved in revenue collection. The theoretical income together with the recent history of collection efficiency figures will become part of the *fundamental data on which annual planning must be based.*

Section descriptions

The section descriptions give the key facts of the sections, which include the section task descriptions, the organization structure, work-load, staffing and all important issues. These descriptions are to be updated at least every six months and kept to a maximum of six pages.

Results and benefits: In keeping these section descriptions up-to-date, the management, in cooperation with the section chief, will review the recent developments in the section and can verify if present staffing and performance are still in line with desired task fulfilment and efficiency. The set of section descriptions serve as a quick briefing for all new and interim managers, and as a reference for all planning activities.

