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Low-Cost Rural Water Supplies Development and Community Participation in Kenya

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LOW-COST RURAL WATER SUPPLIES DEVELOPMENT AND COMMUNITY PARTICIPATION IN KENYA

by
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Thesis submitted to the department of civil engineering, Tampere University of Technology, in partial fulfilment of the requirements for the degree of Master of Science in Engineering

Nairobi, Kenya
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Dedicated to my grandmother who passed away
while I was in Finland

LOW-COST RURAL WATER SUPPLIES DEVELOPMENT AND COMMUNITY PARTICIPATION IN KENYA

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ACKNOWLEDGEMENTS

This study was carried out at the Rural Water Supply Development Project in Western Province, at the Machakos Integrated Development Programme in Eastern Province and at the South Coast Handpump Project in Coast Province. I wish to express my sincere gratitude to the officers working in these projects and the communities of these areas for all the assistance they gave me during this study.

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ABSTRACT

This thesis paper discusses community participation strategies used in low-cost rural water supply development. The paper also discusses the advantages as well as constraints and limitations of community participation.

During the study the implementation strategies used in three projects located in different provinces of Kenya were looked into. These projects were:

1) the Rural Water Supply Development Project in Western Province,
2) the Machakos Integrated Development Programme in Eastern Province and
3) Kwale District Community Water Supply Project in Coast Province.

Mutual respect between the intervenor and the community being helped to develop its own water supply is a very important parameter to the success of the project. During the study the author found that the community preferred officers with open mind - officers willing to take into consideration the community's opinions seriously.

Communication media between the intervenor and the community was found to be important in mobilizing the community. The community members were not interested in lectures from the field officers, but audio-visual aids such as films on water and diseases or slide shows commanded large audiences. Music which is used by most African communities for relaying messages was being used in the Western Project to mobilize the community with good results.

In the Kwale Project women were trained to maintain the handpumps. The author noticed that these women were interested in the maintenance work.

Besides the water supply projects, the communities were involved in other development activities. The author found that some individuals in the community were members of more than five development projects. In Machakos District the departments involved in the Machakos Programme worked in close cooperation holding regular meetings. This enabled the different departments to work harmoniously with the community.

1 INTRODUCTION

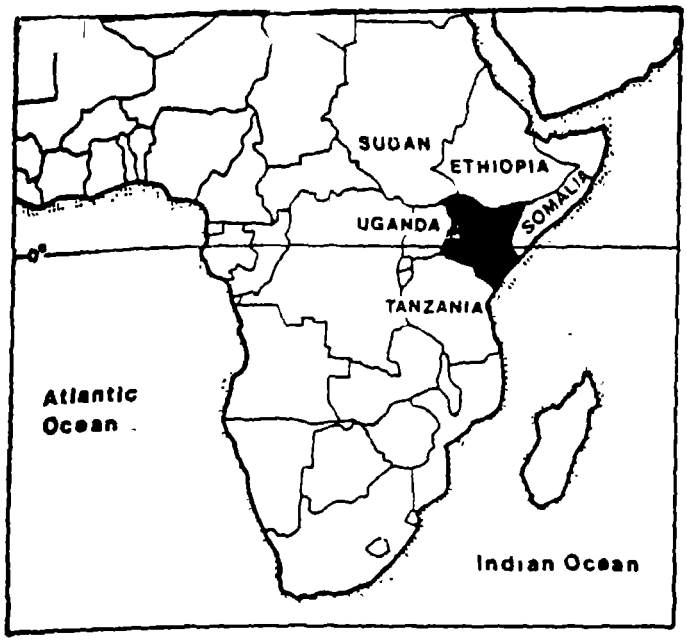
There are more than 2000 million people (about half of the world's population) living in the developing countries. More than 70 % of these people live in the rural areas. It is estimated that three out of every five persons in developing countries do not have easy access to safe drinking water. Additionally, at present many of these countries do not have the required means to provide each one with piped water. Besides many high technology solutions to rural water supply development in these countries within the last twenty years have failed because of their complexity, shortage of maintenance funds and lack of commitment to these projects by the beneficiaries. There is therefore increased awareness of the importance of community mobilization and participation and the use of a technology commensurating to the beneficiaries' maintenance capacity in rural water supply development. This has led donor countries and recipient countries to take a keen interest in exploring prerequisites, strategies and factors which are likely to facilitate community mobilization and participation in project identification, planning and construction as well as operation and maintenance.

The strategy of the Ministry of Water Development in supplying water to the rural areas has changed during the last six years. Instead of implementing only piped water supply projects, low-cost water projects based on point water sources are now under construction in many parts of the country. In this study, community participation practices in three low-cost water supply projects are considered. These projects have been selected so that they represent a broad spectrum of Kenyan communities living under different climatic and cultural conditions. Figure 1 shows the areas covered by these projects.

The projects are:

1) Rural Water Supply Development Project in Western Province (later called Western Project)

The Western Project which is a joint venture between the governments of Kenya and Finland started with phase I which covered the period from late 1983 to December 1985. Phase II which began early 1986 covers the period 1986 - 1988.



KENYA

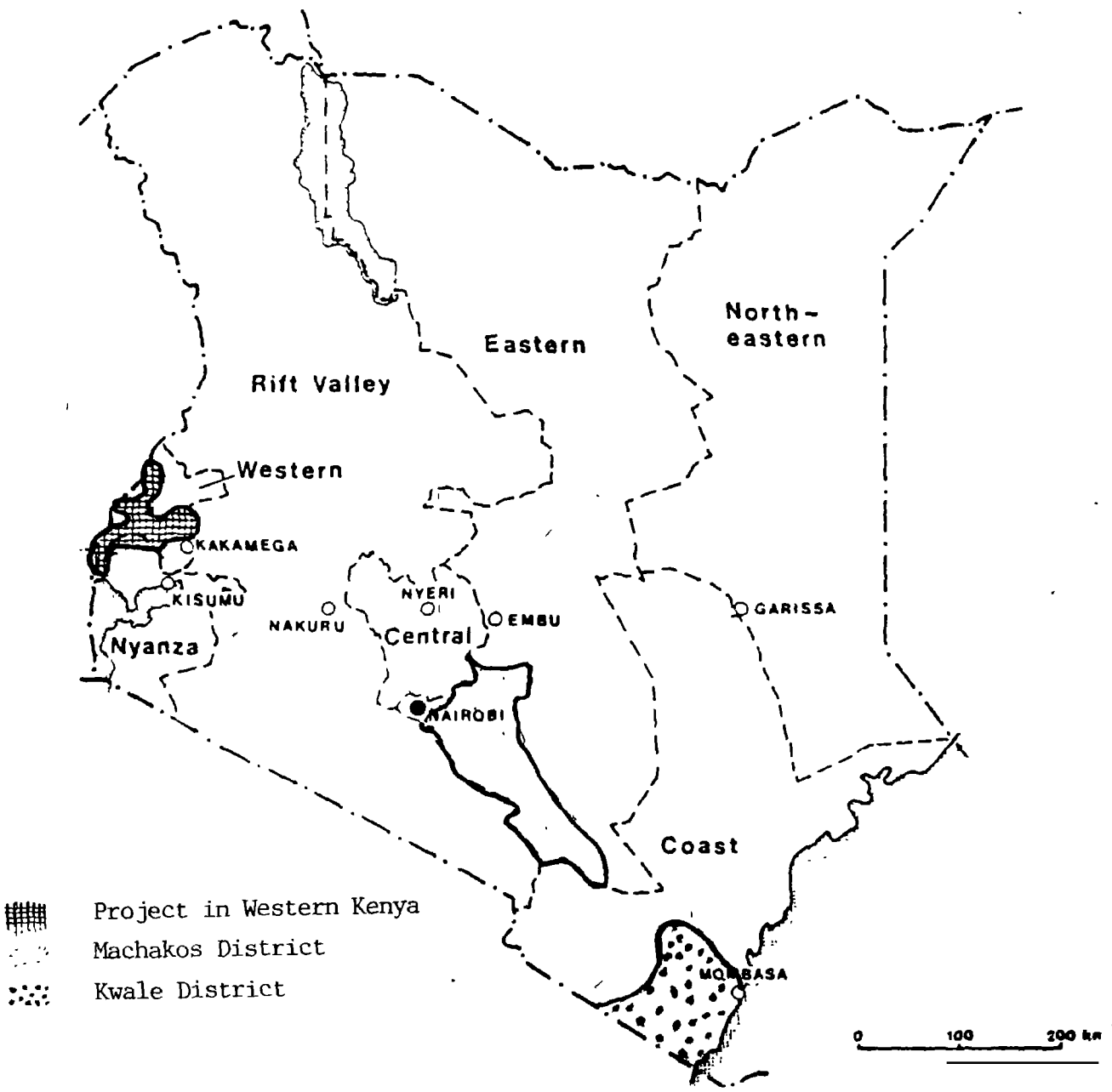


Figure 1. Areas covered by the three projects considered in this study. (Rural Water Supply... 1985, Machakos Integrated Development Programme 1983 and Omambia et al 1985).

The Western Project is being implemented by a Finnish consultant called Kefinco. In terms of design population (1,7 million by the year 2005), this is the largest low-cost water supply project in Kenya at the moment. The water supply is based on:

- groundwater utilization,
- protection of springs,
- rehabilitation of some existing waterworks,
- construction of piped water supplies.

2) Machakos Integrated Development Programme in Eastern Province (later called MIDP)

The MIDP is financed jointly by EEC and the government of Kenya. It is one of the pioneering projects in Kenya's semi-arid areas. Phase I covered the period between 1978 and 1982. Phase II covers the period from 1983 to 1986 and will be followed by phase III covering the period between 1986 and 1991.

The MIDP is planned and executed by its own personnel in Machakos District. The MIDP personnel consists of both local people and expatriates. The low-cost water supply in MIDP is based on:

- sub-surface dams with wells equipped with handpumps,
- hand-dug wells,
- gravity fed water projects.

Today there are also many non-governmental organizations (NGOs) working within water supply sector in Machakos District. These NGOs rely on community participation of the project beneficiaries. The Akamba people (inhabitants of Machakos District) have a long history of community participation dating back to the precolonial times.

3) Kwale District Community Water Supply Project (later called Kwale Project)

Kwale Project is being implemented in two stages. The first stage is the South Coast Handpump Project which was financed by the UNDP. The objectives of this project were:

- development of a handpump that can be used in rural water supplies with limited maintenance requirements,
- supply of water to the communities living in this area with the communities participating in the implementation of the project.

The project was implemented by the World Bank together with the Ministry of Water Development. The implementation phase of the project ended in June 1985. The testing of the installed handpumps is still going on. The second stage of this project is the extension of the South Coast Handpump Project to cover the whole district. Implementation of stage two began in July 1985. The water supply is based on:

- groundwater utilization,
- rainwater harvesting,
- protection of springs.

2 COMMUNITY PARTICIPATION APPROACH TO RURAL WATER SUPPLY DEVELOPMENT

2.1 Community participation and low-cost

The WHO/UNICEF define community participation as "the process by which individuals and families assume responsibility for their own health and welfare and for those in the community and develop a capacity to contribute to their communities' development" (Murray 1984). To some people, community participation is an ideology while to others it is a tool for planning and management.

Community participation became globally fashionable as a development tool in the 1970's. It was the rediscovery of the revolutionary community development experiments begun in several third world countries in the 1950's. African leaders, such as Kenya's Jomo Kenyatta, had tried to draw up strong rural traditions of community self-help as they prepared their countries for independence from the colonial rule. A tradition of mutual help, such as Kenya's "harambee", is not just a group of people coming together for a particular cause, but a part of the community's social system (Chauhan et al 1984).

Low-cost water supplies are those whereby at least their operating and most maintenance can be afforded by the poorer sector of the community and some of the capital and expansion costs can be paid for by the wealthier communities (McPherson et al 1984). Most of maintenance requirements should be within the resources and expertise of the community. Spareparts should be available within easy reach by the community. Any imported sparepart components should be light and inexpensive in relation to the project.

The source of energy and type of equipment used for lifting water from the source to the consumer is the most important parameter affecting the durability and reliability of rural water supplies. Low-cost water supplies should be planned and designed in order to enhance the locally available sources of energy such as human, solar, wind and gravity forms of energy.

2.2 Community participation strategy

2.2.1 Relationship between community and the intervenor

Community participation essentially is a process beginning with acknowledging that people in the villages have a capacity to change their own life provided that some resources and specific expertise can be made available to them (Visscher 1983). The local community's wealth of accumulated knowledge and experience if integrated with the analytical methodology supplied by the intervenor produces the best results as seen by the community.

The intervenor needs to understand why the community behaves as it does (Hersey and Blanchard 1982). Reasons why one source of water is used and another is not used should be understood. When the information obtained indicates the existence of social and behavioral obstacles to achieving health benefits, there are four strategies for dealing with the obstacles (Perrett 1980).

1) Motivational or promotional activities may be considered. These may involve local leadership, demonstrations and/or persuasion through the use of mass media.

2) Ensure that the technology is socially as appropriate as possible.

3) Consideration is given to dealing with behavioral aspects of maintenance. This includes proper handling of the equipment as a preventive measure. This minimizes the high cost of curative measures during breakdowns.

4) Activities such as health/hygiene information or education might be built into the project.

Ironically, too often, participation in a community project tends to be treated like a market research for a new consumer product (Chauhan et al 1983). If the community is indifferent to the product, it is assumed that the answer is to advertise the benefits more widely and educate the target population that this is what it should want. Not often will the intervenor admit that the technology applied was inappropriate. This lack of latitude by the intervenor makes the community not to abandon the old facilities even as they use new ones (Chauhan et al 1983). If the new technology fails the community still has its traditional water sources.

The intervenor should seek the opinion of the more influencial members of the community as well as that of the community based workers. These community based workers comprise of the following categories (Carefoot and Gibson 1984):

1) village health workers,
2) community health workers,
3) community health communicators,
4) family health workers,
5) school teachers,
6) traditional healers,
7) traditional birth attendants,
8) village social volunteers,
9) workers from other sectors (water technicians and local skilled persons).

The community based workers who have been in the area for a long time understand the community felt needs. They know the level of service which is appropriate for the community. In rural water supply development it is necessary to integrate these community based workers in the activities of the water implementing agencies in order to achieve the best results from improved water supplies in the rural areas (Carefoot and Gibson 1984).

2.2.2 Role of women in water supply development

Water collection in rural areas is traditionally the work of women. The degree of hardship arising from the quantitative and qualitative inadequacy of water supplies is not easy to access. The task of collecting water takes from 4 to 6 hours a day. Estimates made in East Africa show that some 15 % of all energy expended by women is used in carrying water (McDowell 1976). In spite of this, women have been consistently excluded from all dialogue about the priority of improved water supply, the possible improvements, the implementation strategy and arrangements for operation and maintenance. The almost total exclusion of women from the whole process of improving water supplies may well be the most significant factor in the disastrous failure rate for improved supplies. There is a challenge to the planners to work out practical methods for ensuring women's participation (Hannan-Andersson 1985).

During the author's field study, it was noticed that the majority of the adult population consisted of women. The men had gone to the urban areas to look for jobs. Most of the rural development has therefore been left to women.

In many communities women often do not speak in large groups containing men. Women should be allowed by the community leaders to attend their (women only) own meetings where they can express their feelings freely (Hannan-Andersson 1985).

Many communities have women organizations. In Kenya there are over 15000 women groups belonging to different organizations (Rural Water Supply... 1985). These women groups are distributed throughout the country. They can be mobilized by the water agencies working in rural areas to take part in water development activities.

2.2.3 Decentralization

In the late 1970's and early 1980's a growing interest in decentralization was seen in many developing countries. It is now viewed as a way to (Gow and Van Sant 1985):

1) improve the planning and implementation of development,
2) facilitate an effective popular participation in the process of development in a more profound way than envisaged in earlier decentralization efforts.

Decentralization has not been smooth and fast in many countries. The main obstacles to decentralization observed during this study are:

1) Existing organization structure

Many ministries have personnel organization charts which are very broad at the lower echelons but very narrow at the upper decision making level. This decision making group is based at the ministries' headquarters because there are no posts in the districts. For this reason most of the issues from the districts have to be referred to the headquarters. This obstacle may be overcome if the ministries' establishment is designed so that senior government professional officers can work at the district level, but do not have to be called to the headquarters after promotions.

2) Government regulations

Government institutions in many countries are run according to a standard set of procedures, rules and precedents resulting in inflexibility and slow response to field needs. It is not uncommon to see an officer travelling 50 km from the field in a 7 ton lorry to the capital city to obtain an item worth less than the fuel consumed by the lorry, while the same item could be purchased in the field for almost the same price. It is therefore necessary to review these procedures so that the senior government officers could exercise some discretion in the field.

3) Opposition from individuals

Decentralization means less power and authority to some people at the top in the ministries. They may be unwilling to delegate responsibility to the field staff who, in turn, are unwilling to share their limited authority with the local community. With decentralization, more people will handle government resources, especially money, leading to a greater chance of misuse of the public resources. There is therefore need to audit public funds regularly.

The government of Kenya decentralized its activities to the district level in July 1983, when the "District Focus for Rural Development" strategy was introduced. This decentralization included:

- Personnel

Government departments at the districts are now headed by senior government officers who are qualified in their respective fields. Water departments at the districts are headed by engineers who have at least B.Sc. degree unlike earlier when the districts were headed by technicians.

- Stores

In the past all the spareparts were obtained from a centralized store in Nairobi. Now the activity of this central store has been decentralized to the districts.

- Procurement

In the past departments in the districts had very little power to give out tenders or award contracts. All tenders above 4000 KES were handled in Nairobi. Now district tender boards have been established with a mandate to award tenders of up to 200000 KES.

- Finance

District treasuries have been established. All the payments for services rendered in the districts are paid in the districts. Earlier all the payments used to be made in Nairobi.

2.3 Organization structure in community participation in Kenya

2.3.1 Administrative organization

The provincial administration within the Office of the President is expected to play a key role in the district focus for rural development strategy. Most of the projects are initiated by the locational development committees which are chaired by chiefs. The proposed projects from the locations are forwarded to the divisional development committees which are chaired by district officers. Both the locations and the divisions do not have technical capacity to provide details of the projects. The purpose of both locational and divisional development committees is to arouse the communities' interest in the projects. Projects are forwarded from the divisions to the district development committees. It is at this level where viability and priority of the projects is discussed. Figure 2 shows the organizational chart for the provincial administration and figure 3 shows the membership for district development committees.

District Water Engineers carry out planning and design of the district's water projects. Provincial Water Engineers study and approve the plans from the districts.

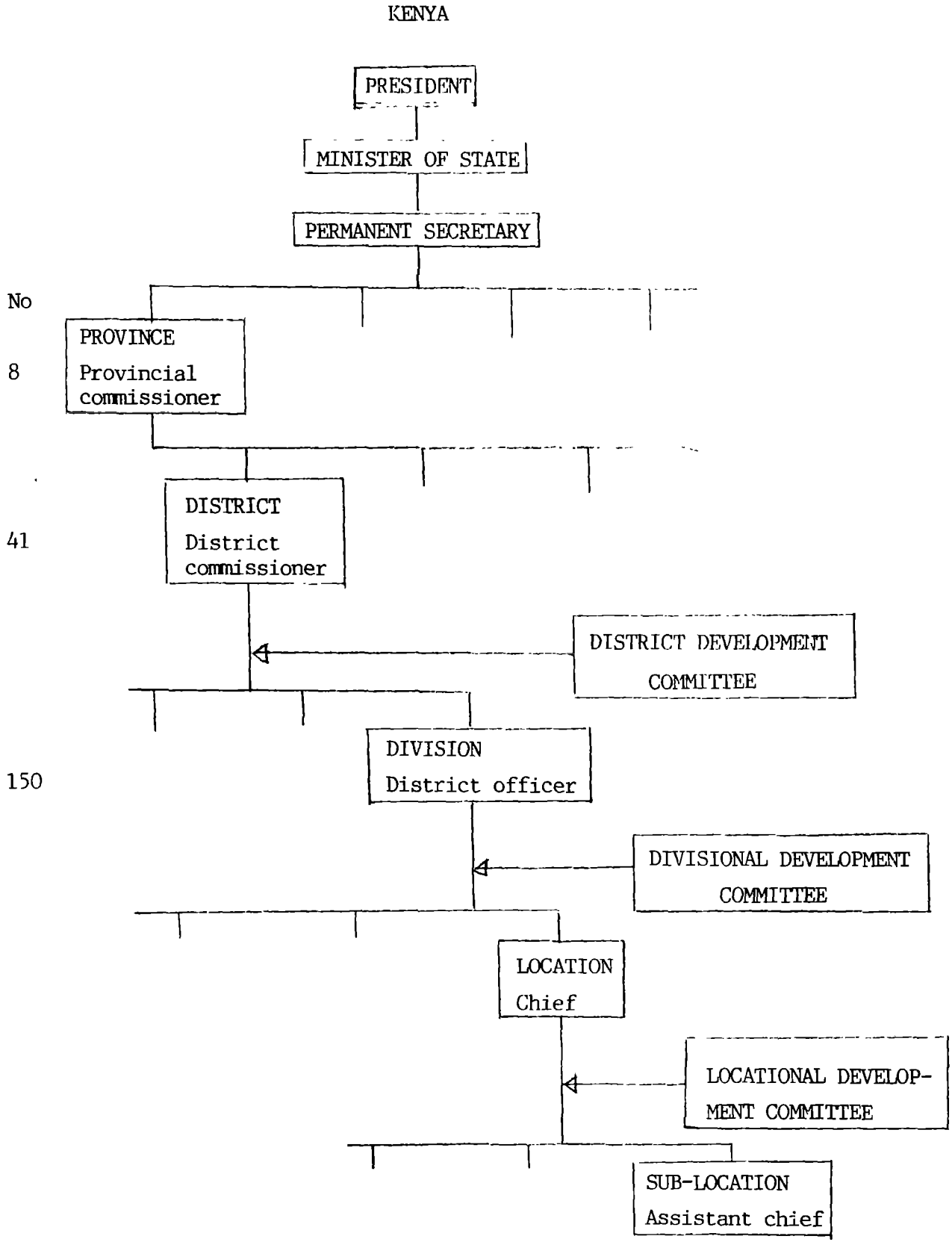


Figure 2. Organizational chart for provincial administration.

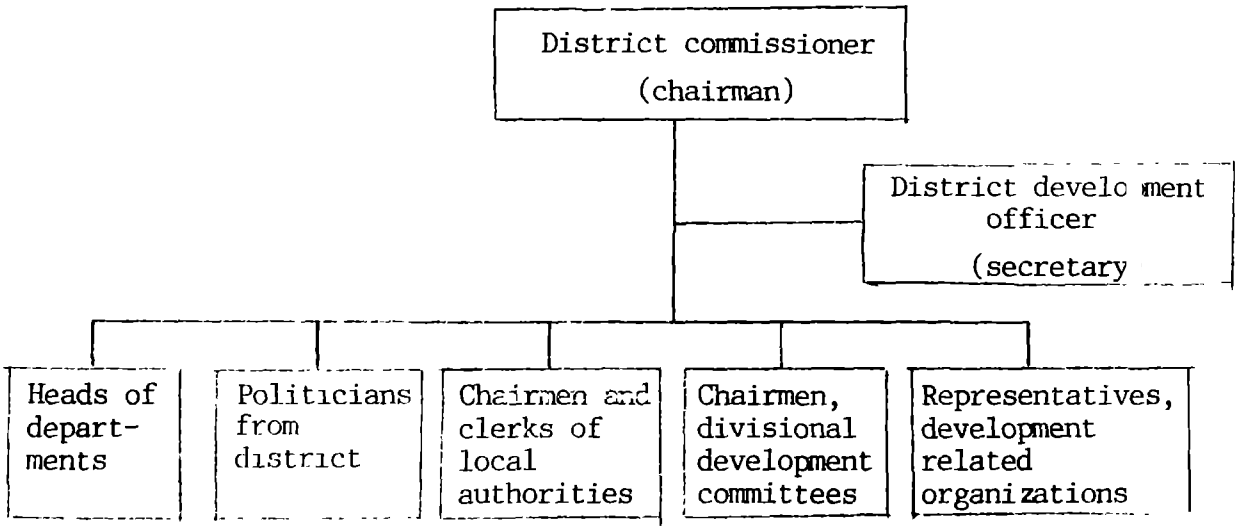


Figure 3. Membership for district development committees.

2.3.2 Community level organizations

In the Kenyan communities there are local leaders, both men and women. These local leaders have different names in different communities. In Western Kenya they are called "Linguru" and in Machakos they are called "Asee motui". In each sub-location there are five of these local leaders. They are appointed by the community members. These village leaders are normally between 30 and 50 years old. They are resident in the community with no intention of moving. They must be literate.

When need for a water supply is felt by a community, the community organized by its leaders forms a water committee. The water committee is registered with the Ministry of Culture and Social Services, which is in charge of all community based organizations. The project proposal is forwarded to the locational development committee. The community begins to collect funds for the water project. Many times the money collected is not proportional to the cost of the project, but it makes the members of the community identify themselves with the project.

2.4 Advantages of community participation

In most cases the intervenor, whether a local engineer or a foreign agency, comes from a better placed class in society than the community. The intervenor and the community have different standards concerning water supply. With community participation, a water supply that the intervenor considers as primitive will be a great improvement to the community needs. Similarly the objectives of the intervenor and those of the community in a water supply are different. The community participates in the project to satisfy a physiological need - need for improved water supply where water exists or need for any water where water does not exist.

The intervenor is motivated either by a desire to help the less fortunate or a desire to be recognised. The foreign donor with a need to be recognised internationally will want to implement a project that attracts a lot of publicity irrespective of the community's needs.

The local engineer might prefer a water supply which provides a professional challenge (such as a water supply requiring full treatment) whereas simpler options (such as hand-dug wells) exist. When the community is involved, it will ask for a water supply that serves the felt need for water. The community's choice of project is guided by the principle of satisfying the immediate need of the participating members and groups. Figure 4 illustrates the motives of the intervenor and those of the community (Hersey and Blanchard 1982).

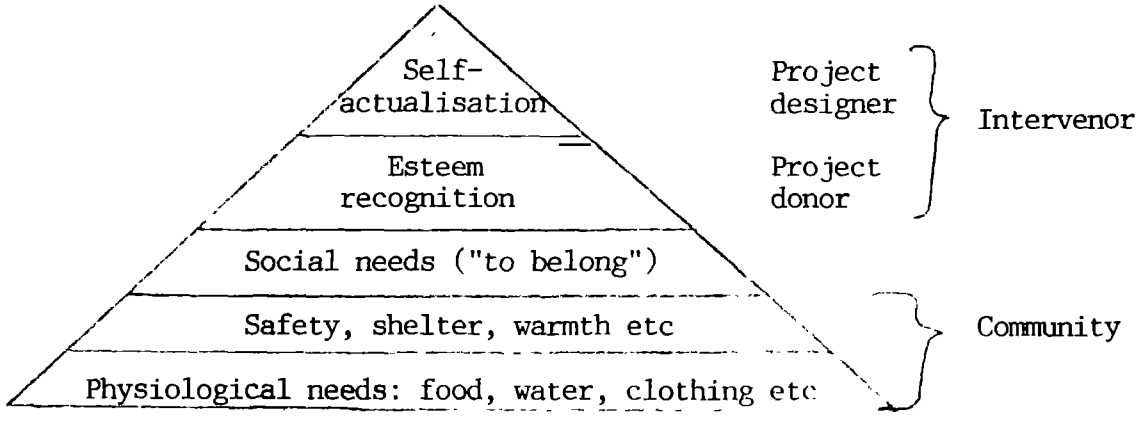


Figure 4. Maslow hierarchy of needs (Hersey and Blanchard 1982).

This local level ideology which can be summarised as "enlightened community and collective self-interest" is a very typical criterion for project choice (Mbithi and Rasmusson 1977).

Many communities in the third world countries were colonized by some western countries. The experience of their colonization is still fresh in many people's minds. If the community sees foreigners working in the rural areas without the community's prior knowledge, the community becomes suspicious. With community participation this misunderstanding does not arise.

In community participation, beneficiaries are physically involved, spending their time, money and efforts. When their opinions are seriously considered by the engineers and the health specialists, the community feels that the project is theirs. In this way they take care of the project. Breakdowns due to vandalism will be very few and in return the project will produce the required results most effectively.

Services in many cases may be provided at a lower cost. This means that with a limited amount of resources more people can benefit. Malawi experienced a substantial saving in the central government's exchequer due to community participation in water supply development. Before the community participation was initiated the construction of a shallow well was 4000 USD or about 30 USD per capita plus about 70 USD a year for maintenance. Through community participation the construction cost of a well was as low as 100 USD or less than 1 USD per capita (one well was estimated to serve 130 persons) (Agarwal 1980).

The community participation approach is heavily biased towards the use of local resources such as labour, local power for transportation (oxen and donkeys) and local materials for construction (earth bricks and stones). Government funds spent when there is community participation can be spread more widely to help more people in the community (Chauhan et al 1983). Use of local materials could also generate research that might be useful to other communities.

Community participation which involves people sharing ideas and working together may act as a catalyst to further development efforts. Good ideas and organizational patterns used by a certain community water supply could be utilized by other groups.

Cultural and social values are always considered when the beneficiaries are involved in the process of developing their water supply projects. With community participation there is also an intrinsic satisfaction that gives to the members of the participating community a feeling of belonging and power.

2.5 Constraints and limitations of community participation

1) Pre-existing government attitudes

Many governments and donors give lip service to community based programmes. The governments are afraid of the political implications arising from community participation because this might create demands which the governments cannot meet.

The ministries often have a technical bias. Standards are jealously safeguarded instead of considering the prevailing condition and the resources available. Similarly the engineers lack skills in community work.

2) Pre-existing community attitudes

If there exists a government constructed, operated and maintained water supply scheme in an area, the community might not support a community based water supply. They would argue why they are asked to contribute for construction of their water supply while other people have received a water supply from the government.

Often a project idea is hatched by prominent persons in the community with political ambitions. If these people fall out of favour with the same community, an element of sabotage may crop in. Many projects have been started throughout the country but some have been left incomplete. This problem has a double negative effect. Besides waste of resources, the community is left demoralized. The people are unwilling to continue contributing to what appears a "bottomless pit".

Similarly projects have been sited in wrong places. Some projects have been located in the most unsuitable places in order to benefit one or a few powerful persons. Others have not been sited in the most appropriate place in order not to benefit a group of people who are deemed political enemies of the community leaders.

Many so called "communities" are not located in village clusters and have no experience in collective decision making (Cross 1984).

The community has other development matters to attend to. There are schools to be built, farms to be cultivated and hospitals to be built. Depending on the community's most pressing need, the other activities might suffer or be postponed.

3) During project planning

There is a possibility of having many possible water sources for a rural water supply. For the same level of service, different alternatives have different cost patterns. One source might require high capital cost but low operation and maintenance cost while another might have a low capital cost with high operation and maintenance costs. In terms of cost the best source is that which during the assumed project lifespan costs less at today's value of money. In most cases the community, unless guided, selects the alternative with low initial costs which is not necessarily the cheapest alternative.

4) During project construction

During the field study the author was informed that if all those who have to work turn up the same day, there are problems of control. The quality of work is poor. It is also difficult to know who has attended and who has not. Some people talk while others work due to the shortage of working tools. It is thus difficult to determine the actual time spent on the project.

In trying to solve the above organizational problems, the approach that has been taken in DANIDA sponsored schemes in Tanzania is to distribute work to people by using the existing political structure of ten cell units in the village level. Manageable groups of two to three ten cell units are given a particular task on a specific day. The advantage of this system is that all members from a ten cell unit know each other. It is not possible to abscond without being noticed (Mujwahuzi 1985).

At times the community starts a large project expecting support from some organization. The money or material so expected does not come. If it comes, it is not sufficient. This has been a common problem in water supply projects started by small non-governmental organizations (McPherson et al 1984).

5) During operation and maintenance

Many self-help water supplies have been designed and constructed without considering the source of resources for operation and maintenance. Shortage of funds and qualified staff has caused many such water supplies to stop operating (McPherson et al 1984). In some cases, construction of systems requiring high operation and maintenance costs instead of simple systems has aggravated the situation. In many cases the provision for spareparts is not considered when opting for a type of machine or technology in self-help water supplies. Some charitable organizations, especially those from outside Kenya, have donated unfamiliar pumping sets to some water projects. For a short time these pumping sets work. Then comes a breakdown. Throughout the country the required sparepart is not available. A newly completed water supply becomes inoperational. The users having contributed time and money to build up the system consider that it is the responsibility of the government to repair the facility during a breakdown. User participation has been seen as a mechanism to reduce construction costs of projects and not as a way of promoting long term project operation and maintenance (McPherson et al 1984).

Absence of preventive maintenance has increased the cost of maintenance. According to a pump repairman in South Kabras, Kakamega District, the well committees are not readily willing to have the bearings of their handpumps replaced while the bearings still function though there is a sign of wear. In some cases, this has caused the handle axle to wear out or the handle itself to break down. A pair of bearings costs between 70 and 100 KES. The handle axle costs upto 350 KES and the handle costs upto 480 KES.

Some well committees do not know how many members they have. There are no proper records. This has made it difficult to collect funds for maintenance from all the water consumers.

3 EXISTING WATER SUPPLY SITUATION IN KENYA

3.1 Government policy on water supply development

Shortly after independence, Kenya set an objective of providing a secure safe water supply to the entire rural population and its livestock by the year 2000 as a prerequisite to rural development (Tippetts-Abbett-McCarthy-Stratton 1980). This objective is constrained by factors such as (McPherson et al 1984):

- very high population growth of nearly 4 % per year,
- insufficient financial resources from the government to construct new schemes as planned and operate and maintain the existing ones,
- more than 60 % of Kenya is arid or semi-arid with very limited surface water resources while groundwater studies have not yet been done for the whole country.

Nevertheless, the government is still committed to its objectives. During the 1984 - 1988 Development Plan, the general objectives regarding water development include (Valdelin et al 1984):

- the adoption of water distributive practices and water pricing policies which will ensure that social objectives are not ignored,
- the provision of incentives for efficient water use and penalizing wasteful or environmentally harmful water use practices, and
- recognition of the principle of cost sharing so that people make contribution towards the provision and maintenance of water services.

These objectives will be reached by adopting among others the following strategies (Valdelin et al 1984):

- The beneficiaries contribute significantly towards the construction and maintenance of facilities. In order to minimize the cost of providing water to people in their homesteads, individual farmers will be encouraged to employ cost effective technologies such as roof catchment, wells and construction of small rural dams.

- Cost recovery will be an essential element in the water supply programmes. In the rural areas water rates should cover at least the direct operation and maintenance costs of water supplies.

3.2 Agencies involved in water supply sector

Three major groups of organizations are involved in the water and sanitation sector.

1) The government of Kenya

The Ministry of Water Development is the principal government agency in water supply. In the rural areas the ministry has two programmes.

- Rural Water Supply Programme

Under the Rural Water Supply Programme, projects are financed, constructed, operated and maintained by the ministry. Revenue is collected by the district treasuries in conjunction with the Ministry of Water Development. In the past the Rural Water Supply Programme stressed the provision of piped water supply for rural areas.

- Self-help Programme

This programme started in the early 1970's. In it the government supports small scale community efforts to solve their water needs. The sources of funding for the Self-help Programme have been:

a) Foreign donor finance

In the late 1970's the government of the Netherlands provided to the government of Kenya a loan of 70 million KES. This loan which was in form of commodity aid only covered the purchase of pipes and fittings. The beneficiaries were to provide free labour. The government of Kenya had to provide the skilled labour. In addition the beneficiaries were to contribute funds amounting to 5 % of the cost of the project. The loan was to assist 120 self-help projects throughout the country. Only 59 of the proposed 120 projects were undertaken. Today about half of these 59 projects are partly or fully operational. Some of the supplies are operated by the beneficiaries while others have been taken over by the Ministry of Water Development.

In 1978 the EEC provided funds to cover self-help water supplies in the country. This programme was called EEC Micro Project. About 28 projects were covered under it. The beneficiaries were to contribute 25 % of the total cost. They were also required to operate and maintain these water supplies.

b) Local finance

The government of Kenya has financed many self-help water projects either through Rural Development Fund (RDF) at the district level or through normal annual voted estimates of the Ministry of Water Development. During the 1979 - 1983 Development Plan, the government had planned to spend 254 million KES in the Self-help Programme. During the 1984 - 1988 Development Plan period, the rural Self-help Programme is to receive 362 million KES.

The beneficiaries have contributed time, money and labour to the self-help water supplies. Although it is difficult to quantify in monetary terms the contribution through free labour from the community, the author estimates that nearly 20 % of the rural population served with improved water supply is through their efforts.

2) Multilateral and bilateral agencies

The contributions of funding take many forms. The precise way in which the agencies are involved depends on separately negotiated agreements with the government of Kenya (McPherson et al 1984).

3) Non-government organizations (NGOs)

The non-government organizations working in the water sector in Kenya are many in number and varied in nature. Broadly, these NGOs may be classified into two groups:

- those directly affiliated with a church organization, and
- those working independently.

Although none of these organizations spends more than a few million shillings per year, the contribution of some NGO groups is far more effective in terms of returns per dollar spent than that of larger organizations (McPherson et al 1984).

3.3 Present water supply coverage in Kenya

The population of Kenya, according to 1985 estimates, is 19 million. Out of this 16 million or about 85 % live in the rural areas (Rural Water Supply... 1985). The rural population with access to improved water supplies is estimated to be 4 to 20 % with widely varying figures from province to province. Water consumption ranges from 50 l per capita per day for those with individual connections to 10 l or less per capita per day for those supplied through point source water supplies such as wells and protected springs (Rural Water Supply... 1985). The population coverage of 4 to 20 % is based on design population and considers the Ministry of Water Development supplies only.

A study based on the existing number of water supplies which are operated and maintained by the Ministry of Water Development gave a population coverage of only 3,5 to 4,2 % in the middle of 1982. The results of this study are summarized in table 1.

Table 1. Population coverage per province (Valdelin et al 1984).

Province	Schemes	Kiosks	Connections		Estimated population coverage
			Flat rate individual	Metered individual	
	pcs	pcs	pcs	pcs	%
Central	41	88	8344	5463	7,5 - 9,2
Eastern	40	53	6459	3960	5,0 - 5,1
Coast	34	94	0	1209	3,0 - 3,3
Western	27	77	2231	1928	3,3 - 3,4
Nyanza	37	187	296	849	1,9 - 2,0
Rift Valley	85	17	1192	2014	1,2 - 1,5
North-Eastern	10	0	126	122	0,7 - 0,8
Total	274	516	18648	15545	3,5 - 4,2

Assumptions:

Kiosk supplies:	200 persons/kiosk
Flat rate individual connections:	13 - 16 persons/connection
Metered individual connections:	8 - 11 persons/connection

Two reasons mainly account for the discrepancy between the design coverage figures and the actual figures:

1) In the design calculations, it is assumed that:
- 30 - 40 % of the population will be served through individual connections, and
- 60 - 70 % of the population will be served through water kiosks.

In a typical piped water supply 30 % of the population is served through individual connections. The water kiosks serve only 5 % of the population (Valdelin et al 1984). Thus only 35 % of the design population is served. Through individual connections having the flat rate (where the charges are fixed irrespective of the water consumption) more people per connection are supplied than assumed in the design calculations. People expected to obtain their water from the water kiosks, obtain it from their neighbours who have flat rate individual connections.

2) Inadequate operation and maintenance funds, negative and demoralizing attitude towards many completed projects inter efficient working of many water supplies. During the author's field visit to Busia District in Western Province in November 1985, the following information in table 2 regarding the seven piped rural gazetted water supplies in the district was gathered. (Gazetted water supplies are operated and maintained by the Ministry of Water Development.)

Table 2. Rural gazetted piped water supplies in Busia District.

	Connections		Days without production (1985)			Days without production in the three months
	Metered	Flat rate				
	pcs	pcs	July	August	September	
Busia Hills	51	0	20	31	30	81
Port Victoria	61	0	13	9	6	28
Sio Port	24	0	11	2	3	16
Funyula Nangina	35	0	31	31	30	92
Munana	14	0	4	9	7	20
Bujumba	43	0	9	5	10	24
Wakhungu	17	0	5	10	5	20

The total number of connections in all the seven water supplies is 247. Assuming that the number of connections in each water supply is proportional to the water produced, the effective time when all the seven supplies have been out of operation (given by equation 1) is 45 days in three months or 50 % of the time.

$$T = \frac{\sum_{ws=1}^{7} (C \times D)}{247} \qquad (1)$$

where T = number of effective number of days when all the seven water supplies did operate in 3 months

C = number of connections in each water supply

D = days the supply did not operate

3.4 Cost of water supplies

3.4.1 Development costs

Expenditure of 402 million KES had brought water to 1,46 million rural people by 1976. An expenditure of 5760 million KES at 1976 prices was foreseen as the minimum investment required to serve an additional 13,6 million people by the target year 2000 (Tippetts-Abbett-McCarthy-Stratton 1980). The per capita cost of this estimate was 425 KES at 1976 prices.

Table 3 shows costs of water supplies either at the final design or under construction. The water supplies are in different parts of the country and are also based on different types of sources of water.

Amboseli is the most expensive in the table with per capita of 5760 KES. This project covers a very large area, half of the area covered by Western Kenya Rural Water Supply. However, the population is 100 times lower than that of the Western Kenya Rural Water Supply. Most of the water in this area is for livestock. The condition found in Amboseli is common to many parts of Kenya where the population density is low.

Table 3. Cost of water supply schemes.

Scheme	District (Province)	Supply area	Design population	Demand		Cost estimate KES			Type of water supply
						Total	Per		
		km²	x 10^3	m³/d	l/c/d	x 10^6	capita	KES/l/d	
Amboseli	Kajiado (Rift Valley)	1885	16,5	2450	148,5	95	5760	38,8	Surface piped water project
Kikoneni	Kwale (Coast)	470	88	4178	47,5	35	398	8,4	Surface piped
Kiteta	Machakos (Eastern)	894	221	16156	73,1	118	534	7,3	Storage dam + pumping
Greater Nakuru	Nakuru Kericho Baringo	3250	1017	112383	110,5	2340	2300	20,5	Surface piped gravity + pumping
Gatango	Muranga (Central)	180	114	8300	72,8	50	439	6,0	Gravity
Western Kenya Rural Water Supply	Kakamega Bungoma Busia Siaya	3653	1681	65000	39,0	850	505	13,0	Groundwater handpumps

The Western Kenya Rural Water Supply has community participation. The per capita of 505 KES does not include the community contribution in the project. One well is assumed to supply 200 persons. This makes the cost of a well equipped with a handpump 101000 KES or 6310 USD.

The mean per capita cost of nearly 41 proposed piped water supply projects at design stage within the Ministry of Water Development is around 1000 KES. The current development budget is around 700 million KES. All this money does not go to actual water development activities. Nevertheless, even if all the money was spent on water supply development, this gives a per capita of nearly 600 KES by the year 2000. There are therefore three options if the objective of providing the whole rural population by the year 2000 is met:

1) increase the development budget so that the per capita expenditure on water is nearly 1000 KES,
2) increase the community participation so that the beneficiaries contribute nearly as much as the government's contribution, or
3) implement low-cost water supply projects which are designed to utilize locally available resources.

It is the author's opinion that the government's development budget is unlikely to be increased to the required level.

3.4.2 Operation and maintenance costs

Operation and maintenance of water supplies vary widely depending on the type of scheme and level of service. Costs of operation and maintenance of piped water supplies during the 1982/1983 are shown in table 4.

The design criteria assumes that in the rural areas, 70 % of the population consumes 25 l/c/d and the other 30 % consumes 50 l/c/d, giving an average of 33 l/c/d for the whole rural population. If all the 16 million rural people were served with piped water, the total consumption would be 190 million m^3 per year (table 5).

Table 4. Operation and maintenance costs of piped water supplies in KES/m^3 (Valdelin et al 1984).
(16 KES = 1 USD, December 1985)

Operation and maintenance costs	Gravity schemes		Pumping schemes
	Untreated KES/m^3	Treated KES/m^3	Treated KES/m^3
* Direct operation and maintenance	0,30	0,60	2,40
** Total operation and maintenance	1,50	2,10	3,90
Total operation and maintenance + capital ***	3,50	4,60	6,40

* Direct operation and maintenance considers only the costs of fuel and spare-parts for equipment.

** Total operation and maintenance considers * plus the overhead costs.

*** In design calculations the lifespan of a water supply project is 30 years.

Table 5. Estimated operation and maintenance costs for 190 million m^3 of piped water in KES.

Operation and maintenance costs	Gravity schemes		Pumping schemes
	Untreated KES	Treated KES	Treated KES
Direct operation and maintenance	57	114	456
Total operation and maintenance	285	399	741
Total operation and maintenance + capital	665	874	1216

The present recurrent budget is around 300 million KES. This budget covers salaries as well as other recurrent expenses. With proper financial management, the present recurrent budget should be able to provide water to the presently served 20 % of the rural population.

3.5 Past history of community participation in Kenya

The community participation or self-help movement known as "Harambee" in Kenya within construction and maintenance of improved water supply sector has grown rapidly since Kenya's independence in 1963. However, community participation in construction and protection of traditional water sources has always existed in many communities, especially those living in arid and semi-arid parts of Kenya.

During the colonial period the African Development Committees (now county councils) constructed some water supplies mainly in market places. Some county councils did not have adequate resources to maintain those water supplies. They were handed over to the beneficiaries. Since the beneficiaries were not ready and prepared, many of these water supplies fell into disuse. Figure 5 shows an abandoned storage tank of a former county council water supply.

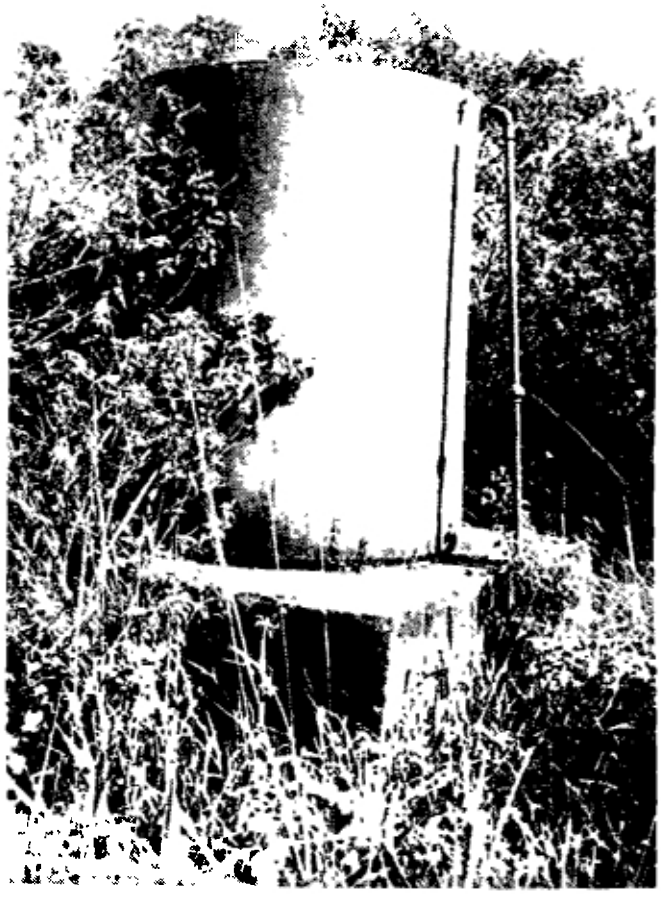


Figure 5. An abandoned storage tank of a piped water supply scheme constructed by a county council in Busia District.

The colonial government, through a government department called African Lands Development (ALDEV) constructed a number of water supplies in the rural areas. These water supplies were mainly earth pans or dams without any pipe network. They were used by both people and livestock. Since these dams were constructed through forced community labour, the community showed apathy towards the water supplies.

In the mid and late 1960's, the Ministry of Health through the Public Health Department in conjunction with the UNICEF constructed a number of water supplies throughout the country. The communities were involved during the construction of these water supplies. The projects were designed by public health technicians from the Ministry of Health who lacked proper knowledge in the design of water supply projects. Slowly these water supplies began to disintegrate until most of them were non-operational because of technical reasons.

4 COMMUNITY PARTICIPATION IN RURAL WATER SUPPLY DEVELOPMENT PROJECT IN WESTERN PROVINCE

4.1 Description of the project and project area

The Western Project is a joint venture between the governments of Kenya and Finland. It is being implemented by a Finnish firm called Kefinco. The Western Project is developing five types of water supplies:

a) hand-dug wells equipped with handpumps,
b) machine drilled wells equipped with handpumps,
c) spring protection programme,
d) rehabilitation of old water supplies, and
e) construction of piped water supplies.

The emphasis of the Western Project is on groundwater resources. About 7000 handpump wells and some 1000 protected springs are planned (McPherson et al 1984).

This study covers only a), b) and c). These three types of water supplies have community participation starting from the siting of wells and springs to the operation and maintenance of the handpumps used in the wells. The community participation in e) is limited only to project identification at the district development committees, while in d) there is no community participation.

The project has two categories of staff:

1) Management staff

The management staff consists mainly of Finnish experts stationed at Kakamega. The number of these experts is limited to 10. There are plans to have Kenyans in the project management team.

2) Community participation staff

The community participation staff consists of Kenyans. Most of them come from the project area. The field staff is divided into five groups:

- siting team,
- geosurvey team,
- maintenance team,
- committee reactivating team, and
- community training team.

To the author there did not seem to be much interaction between the Provincial Water Office and the Western Project because both were operating in different areas within the province.

The project covers parts of all the three districts of Western Province, namely Kakamega, Bungoma and Busia, and Siaya District in Nyanza Province. The total project area is 3653 km^2. This constitutes 50 % of Western Province and 5 % of Nyanza Province. The present population in the project area is 810000 people, which makes 222 persons per km^2. The population growing at the rate of 3 - 3,5 % annually is expected to reach nearly 1,7 million by the year 2005.

The mean annual rainfall in Western Province varies from 1000 mm near lake Victoria to about 2000 mm in the area near Kakamega. According to the Ministry of Water Development classification based on rainfall, the project is in a high potential area (over 1000 mm).

Western Kenya is rich in surface water resources. Lake Victoria, one of the largest fresh water lakes in Africa, is within Western Kenya. There are also many perennial streams in this area. In spite of all these surface water sources, the amount of potable water is limited. Cholera, bilharzia and other waterborne diseases are fairly common in many parts of the project area.

The per capita income in this area is one of the lowest in the country. The per capita of Western Province is only higher than that of the dry arid North-Eastern Province. In 1976 it was 660 KES which was 37 % of the national average (Rural Water Supply... 1985).

4.2 Community preparation

4.2.1 Increasing consumer awareness and motivation

Improved water supplies alone will not make people healthier. People get sick from drinking or washing with dirty or infected water. However, they do not necessarily become healthier by obtaining their water from an improved source. Western Project realising the importance of health education established a training team. For public motivation the training team has a mobile film show, music instruments and demonstrative drawings. During the day-time the six members of the training team are discussing water problems with the well committees. In the evenings from 18.00 to 21.00 the training team moves to the market places or to school compounds to educate the water consumers through public talk, music and film shows.

The film shows indicate the three stages at which water could be contaminated or polluted:

1) Contamination at the well

If dirty objects are placed at the spout of the handpump, water will be contaminated as it passes into the containers used for carrying water home. Dirty containers will also contaminate water from the well.

2) Contamination on transit

Water carried in open buckets is exposed to all forms of pollution. Using dirty leaves to cover the water may also contaminate it.

3) Contamination in the house

Storage of water in a clean environment is important. The community is advised to store drinking water in different containers from the water for washing.

The community is educated also through posters showing how diseases move from a sick person through water to another person.

At present it might be difficult to gauge the impact of this community education suffice to say the instances of cholera which have been rampant in this area have fallen considerably.

Figure 6 shows one possible way of contaminating clean water. Figure 7 shows the training team singing the "Water and health" song.

Figure 6. Dirty leaves can contaminate clean water. The well is in Busia District in Western Province.

Figure 7. Training team singing "Water and health" song in Kakamega District.

4.2.2 Well committees

For the success of rural community operated and maintained water supplies, formation of effective committees is of great importance (Charnock 1985). In the project area 637 well committees had been formed by October 1985. This number is always increasing as new wells are completed. The breakdown of these committees is as shown in table 6.

Table 6. Well committees per district in Western Project established by October 1985 (Kefinco 1985 a).

District	Wells with committees			Well committees without proper information
	in school compounds	in public places	total	
Kakamega	88	186	274	55
Bungoma	30	55	85	7
Busia	55	82	137	8
Siaya	25	19	44	27
Total	198	342	540	97

Each well committee has 9 - 14 members. It is required that at least half of the members are women. The well committee members must be full time residents in the project area. The chairman, secretary and treasurer of the well committee must be able to read and write the Swahili language. School head teachers are members of well committees for wells located in school compounds. The committees are formed as soon as a well has been sited in the area. Even before the well has been dug or drilled, the training team moves to the area to discuss with the committee about the ways and means of operating and maintaining the proposed well and handpump. The following topics are discussed in the meeting:

1) maintenance revenue collection,
2) well cleanliness and utilization of the run-off water for growing vegetables, and
3) proper record keeping.

Before the well is equipped with a handpump the team is required to have raised over 1000 KES. During the operating phase of the well, the training team from time to time will visit the well committee to discuss the progress and condition of the well. Figure 8 shows a well committee and the training team discussing the revenue collection. The well (seen in the background) had broken down. It was repaired by the maintenance team after only two days.

Figure 8. A well committee discussing with the training team during a well handpump breakdown in Busia District.

4.2.3 Training courses for pump attendants

The pump attendant training courses started in February 1985. The courses are held in the field near the water project beneficiaries. They were designed to last for six days but due to inadequate training staff (there are only six training officers covering the whole project area) the training period has temporarily been reduced to three full days.

The subjects covered during the course include:

1) water related diseases and health,
2) home hygiene and sanitation,
3) handpump structures and their mode of working,
4) handpump faults, repairs and preventive maintenance,
5) water wells, structures and construction, and
6) responsibilities of well committees.

The course is divided into three parts:

1) Theory work

Theory work includes lectures, film shows and demonstrative drawings. Common parts of the handpumps used in the area are also shown to the participants.

2) Group discussion

The class is divided into random groups of ten persons each. The groups are given tasks and asked to formulate their solutions. A spokesman for each group then presents the solution.

3) Field demonstration

The participants visit a number of wells with different makes of handpumps. Some of these handpumps would be dismantled and reassembled while the participants watch. There are plans to have the participants taking part in the exercise of dismantling and reassembling. The participants are also shown proper methods of handling handpumps.

At the end of the course the participants are given a small test after which all of them get a certificate.

The author attended the course offered 22 - 24 November 1985. There were over 40 participants - nearly equal number of men and women. The course was opened by the leader of women groups in South Kabras Location. Also in attendance as participants were:

- one sub-chief from the location,
- a Ministry of Health technician from the division,
- a Ministry of Culture and Social Services officer from the division, and
- a number of school teachers from the area.

The presence of the officers as participants was very useful. The participants from the community felt the importance of such a course when they saw these officers attending.

The participants were also provided with free lunch. This was observed to promote good public relations. The participants were very enthusiastic about this course. They felt that three days was very short for such an important course.

The course was closed by the chief of the area who also presented certificates to the participants. He advised them to take good care of their wells and practise what they had learnt. Figures 9 and 10 show participants at the South Kabras Location course.

Figure 9. Participants during group discussion in groups of ten. South Kabras Location in Kakamega District.

Figure 10. Chief of the area presenting certificates to the participants. Third from left is a sub-schief who participated in the course.

4.2.4 Training of repairmen

The repairmen have been operating only in two areas on experimental basis. The experience gained in this pilot maintenance programme has been positive so far.

The objective of the project management is to have two repairmen in large locations and one in small locations. All the well committees in the location nominate a person who must be trusted and permanently staying in the location. Persons with basic knowledge in similar pursuits such as bicycle repairing or blacksmiths are preferred.

Through a series of interviews by the Western Project, one or two persons are selected. The project plans to produce two to three repairmen during the phase II which has just started. Currently the training courses take between two to three months. The courses are contacted in Kakamega town and they include:

1) knowledge on working principles of different types of handpumps,
2) knowledge on different parts of a handpump,
3) more emphasis on the types of handpumps used in the area of the repairmen,
4) public relations,
5) stores and record keeping,
6) field demonstrations on handpump repair.

Additional training for the already trained repairmen will be necessary from time to time especially when new types of handpumps are introduced in the area or when the performance of the repairmen needs improvement. Additional training programmes which will take two months have been planned. The repairmen will also be given on-the-job training by the project training team.

4.3 Project implementation

4.3.1 Siting of wells and springs

Siting of a well in an area is governed by the following conditions.

1) The well should be within the communities' area administratively. Hence a community cannot site a well outside its location. The chiefs and the assistant chiefs help the community with regard to the location's boundaries.

2) The proposed well site should be a top priority area. Preference should be given to schools, health centres, churches, market areas or the village centre.

3) The well should be able to serve 200 people within a radius of 1 km.

4) The well is not a private property. The Western Project has a programme indicating the time and number of wells to be constructed in an area during a particular time. This information is given to all the areas concerned so that it could be discussed at the locational and divisional development committees.

When the time to move to an area comes, the Western Project's community training and development officer informs the area's chief through writing. A week later the siting team moves to the area. Together with the area's assistant chiefs and community leaders called "Linguru" possible sites for wells are selected.

The number of permanent springs in the project area was identified and documented during phase I of the project. However, the number of springs that can be protected in an area at a particular time is fixed. If there are more springs in an area than can be protected at that particular time, the community gives its priority of the springs to be protected.

After well siting the community training and development officer organizes a meeting in the area. Representatives from relevant government ministries and other local leaders in the area are invited to attend this meeting. The most important reason for this meeting is to arouse the community's enthusiasm. If the community is not interested in the project from the beginning, there is a great probability that the system will not be widely used or that it will fall into disrepair in a short time (Falkenmark 1982). The order in which the wells will be constructed in each sub-location is also discussed in this meeting.

Figure 11 shows the community training and development officer discussing with community representatives during a well siting process in Buchumba Location in Busia District. In this meeting there were representatives from the following ministries:

1) Office of the President - sub-chiefs,
2) Ministry of Health - divisional health technician,
3) Ministry of Culture and Social Services - divisional community officer.

Notably absent from this meeting was a representative from the Ministry of Water Development.

Figure 12 shows representatives from two of the four sub-locations discussing the priority order in their sub-locations.

Figure 11. A well siting discussion in Busia District.

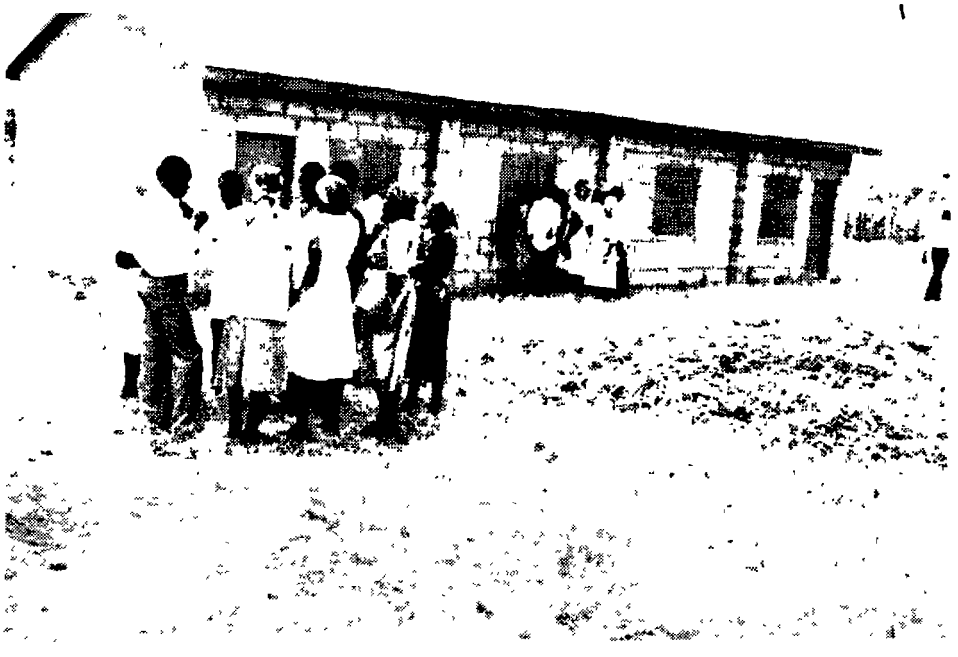


Figure 12. Members discussing the priority list in their sub-location in Busia District

Within one to three months after identifying the well sites, the geosurvey team carries out a study to determine the exact well sites and also which wells will be dug by hand and which wells will be machine-drilled. In the earlier phases of the project geophysical methods were not used and nearly 50 % of the wells were dry. When resistivity surveys were introduced, an almost 100 % success rate has been achieved. The cost of a resistivity survey is approximately 5 % of the cost of a drilled well. In October 1983 the estimated costs for various wells were (McPherson et al 1984):

- 35 mm machine drilled well	30 400 KES
- handpump well lined with concrete	22 300 KES
- shallow well lined with bricks	13 600 KES
- protected spring	4 000 KES

All cost estimates include materials, supplies, local salaries, fuel and transportation costs and capital costs of vehicles.

For siting hand-dug wells a one-channel hammer seismograph (model Bison 1550) has been used for one year by the end of 1985 with promising results. Hand-dug wells are located more than 100 m from latrines or graves.

4.3.2 Construction of hand-dug wells

The best time to dig a well is at the end of the dry season when the water table is at the lowest. During the dry season the earth is also more stable making it possible to dig without any wall supports. Wells dug during the rainy season run dry during the dry months and are deepened later. Tools needed for construction are buckets, rope ladder, shovel, hammer and chisel.

A schedule for hand digging and machine drilling is made and given to the well committees. It is based on the communities' priorities and also on the resources available in the project at that time since the completed wells and boreholes should be equipped as soon as possible.

The community is given upto 4 weeks to dig the well to the water level. The well diameters are 1,4 m. The soils in the project area are firm and in most cases need for supporting the well sides during digging has not risen. The digging is done by the community members either on rotation basis or a few persons have

been paid by the members to dig. The average depth of wells is from 8 to 10 m and the cost of digging the well is from 500 to 1500 KES. After reaching the water level the well committee chairman informs the Western Project office.

In the past the Western Project used to have teams for well completion. Presently completing the dug or drilled wells is done by local contractors who have been trained by the project. There are 10 such contractors throughout the project area. The contractor given the work in the area collects the materials he cannot find in the field from the project stores. Such materials include porous and non-porous concrete rings, concrete covers for the wells, handpumps and the necessary pipes and fittings. A well needs 16 to 20 concrete rings of 0,5 m height. The two lowest concrete rings are porous while those above are non-porous. The community members bring the sand and stones required during the construction. Figure 13 shows the structure of a completed well ready for pump installation.

Figure 13. A well ready for equipping in Busia District.

The contractors are paid for the labour and any other expenses by the project. With a cost of a drilled well as 30 400 KES and that of a dug well as 22 300 KES, the per capita cost of a drilled well comes to less than 150 KES and that of a dug well lined with concrete rings comes to about 100 KES. One well has 200 to 250 consumers. When the whole project is considered, however the per capita cost is 505 KES.

It was not immediately clear to the author why the per capita cost of the project is more than three times the per capita cost of constructing a drilled well considering that the project is based on groundwater with the number of machine-drilled wells nearly equal in number to the hand-dug wells. On average, a machine-drilled well should be the most expensive type of water supply in the project. The per capita cost of 505 KES thus seems to be on the higher side, the cost of the expatriate staff not withstanding.

4.3.3 Protection of springs

Over 2000 permanent springs have been identified in the project area. It is the ultimate aim of the project to eventually develop and protect the high yielding of these springs.

During phase II (1986 - 1988) of the project 200 springs per year will be developed and protected. The following proposals have been recommended during the phase II.

- Community participation in spring protection should be enhanced with spring committees formed and also training regarding the importance of protected springs. This has been lacking during the phase I of the project.

- Where the yield allows, the use of hydrams for pumping water or use of gravity reticulation to bring water to the village should be encouraged. Most of the springs are situated in valleys. This makes to access difficult which results in the community perceiving no real improvement to its water supply since traditionally the people have walked down to the valleys to collect water.

- The community will make access roads to the springs. People will also bring in construction materials. The local tradesmen will be used in construction of the spring protection devices.

- The cost of protecting springs is considered the simplest and lowest of all improved water supplies. Springs also have an important advantage: they are traditionally accepted.

The low community participation in the spring protection programme has resulted in poor maintenance for the springs. Only few springs have been fenced. This leaves many springs exposed to pollution.

Figure 14 shows the time schedule for well and spring construction programmes (Kefinco 1985 a).

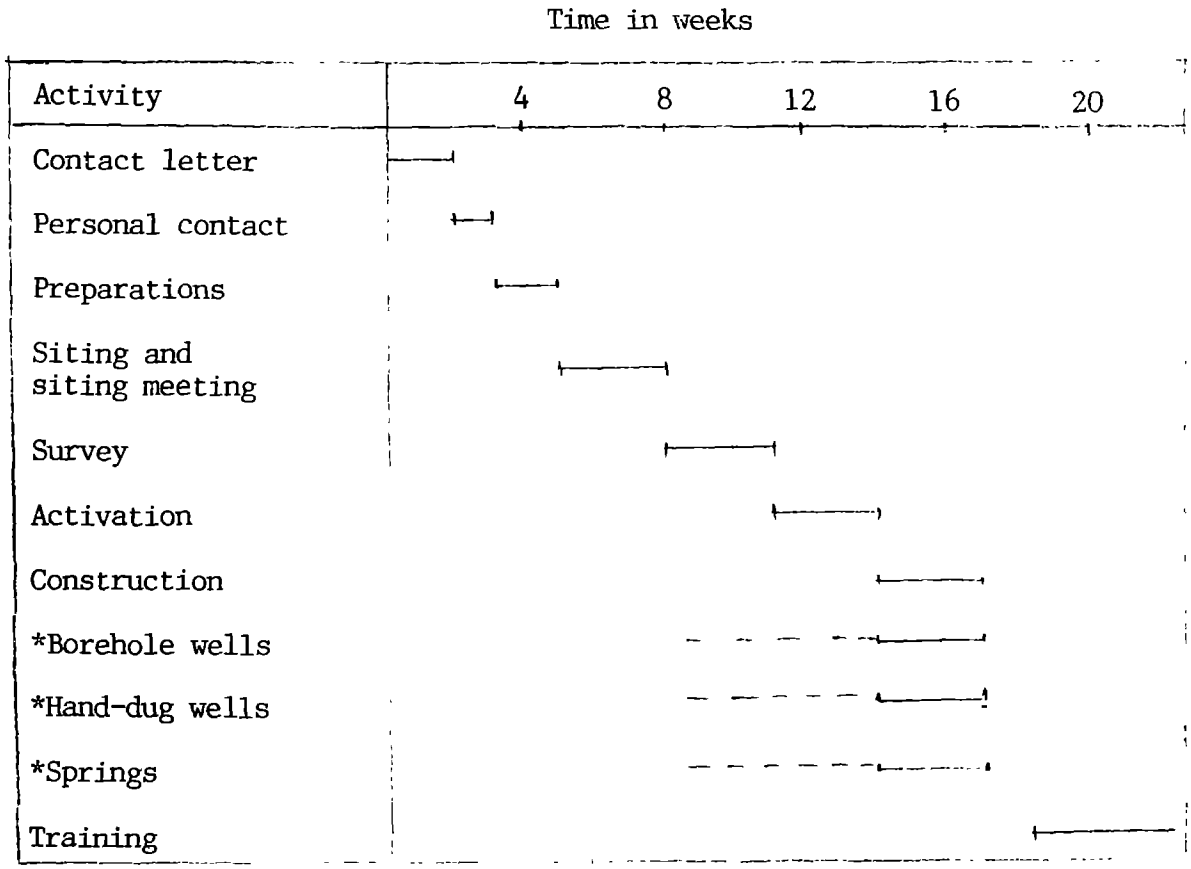


Figure 14. Community activation and construction of wells and springs timetable (Kefinco 1985 a).

* Construction of wells or protection of springs may start after the community's siting if survey is not necessary.

4.4 Operation and maintenance

4.4.1 Routine maintenance of wells

The well committees appoint women in their areas as pump attendants. These women should be living near the wells. They should be able to read, write and understand the Swahili language. The Western Project has developed work forms that are used by the pump attendants in their work. These forms have to be filled after every three days. If they are correctly and honestly filled, they give the condition of the wells and the handpumps quite accurately. These forms are submitted to the project Kakamega office monthly for well monitoring.

The pump attendants are trained to understand what parts of a handpump require a regular greasing. The attendants also keep the well compounds clean.

4.4.2 Repair during breakdown

Two practices for repairing breakdowns of handpumps are in operation.

1) Field repairmen

It is the ultimate goal of the project management to have all the repair work done by the local field repairmen. One repairman can handle 50 - 60 wells.

The committee chairman of the broken down well informs the local repairman who will study the problem and the spareparts required. The repairman has a small store containing a number of spares which he buys from the project's Kakamega store. After the repair work the repairman is paid for his services on the spot by the well committee. He issues the committee with a receipt for the money received.

At present the repairmen have been introduced only in two areas. These are South and North Kabras Locations and parts of Malakisi West and South Bukusu Locations.

2) Mobile repair team

After a handpump breakdown, the well committee chairman informs the Kakamega office. He explains the nature of the breakdown - if he is able to recognise it. He also tells how much money is available for the maintenance. The mobile repair team moves to the site and repairs the breakdown. After the repair work the team is paid for the service on the spot. The training team which moves from one area to another within the project area may also inform the Kakamega office of the wells with problems.

In some cases well committees have been without adequate funds during a breakdown of their well handpump. The repair work in such cases is carried out and the well committee given a date on which the money should be paid. This problem of not being paid in time has been felt more by the pump repairmen who are not able to buy more spareparts from the project. This causes other wells to suffer because of the lack of spareparts readily available at the repairman's store.

Figure 15 shows the pump repairman from South Kabras repairing a handpump while participants to the South Kabras pump attendant course look on. Figure 16 shows the mobile repair team repairing a Mono handpump. The spareparts were not available. The pump was removed and taken to Nairobi where spares might be obtained. The well is in a school compound.

Figure 15. A pump repairman (with a cap) repairs a handpump in South Kabras in Kakamega District.

Figure 16. A mobile repair team repairing a Mono pump in Kakamega District. The required spares were not available in the project area and they were to be obtained over 400 km in Nairobi.

4.4.3 Administration and supply of spareparts

In the project many types of handpumps are in operation. Some of the handpumps are on experiment and thus backed with spares by those behind the experiments. However, the two commonest types of handpumps in the area are India Mark II and Nira AF-76. India Mark II is being produced in a village polytechnic within the project area. The name of this village polytechnic is Western College of Arts and Applied Sciences (abbreviated WECO). Spareparts for the India Mark II are therefore readily available. The Nira AF-76 comes from Finland. At present imported spareparts are also readily available.

At present spareparts are obtained from Kakamega. There are plans to see if these spares could be stocked in some shops nearer the wells. The committee members or the pump repairmen could then buy the spares from the shops.

Another option is to study what parts in a handpump wear out and after how long a time. The well committees could then be advised to stock some of these parts. It is safer for committees to stock spares than keep money. While money could be misused, spareparts could be stored without any risk.

4.5 Cost of maintenance and collection of revenue

The costs of spareparts depend on the type of the pump. Figures 17 and 18 show the sparepart costs for the two commonest pumps in the area. The labour charges depend on the point where the breakdown occurs (Kefinco 1985 a).

- Work done on the pump above ground level 50 KES
- Work done down to the depth of 21 m 75 KES
- Work done in depths of over 21 m 100 KES

The maintenance costs for wells between September 1984 and September 1985 are shown in table 7.

Table 7. Maintenance costs in KES between September 1984 and September 1985 (Kefinco 1985 a).

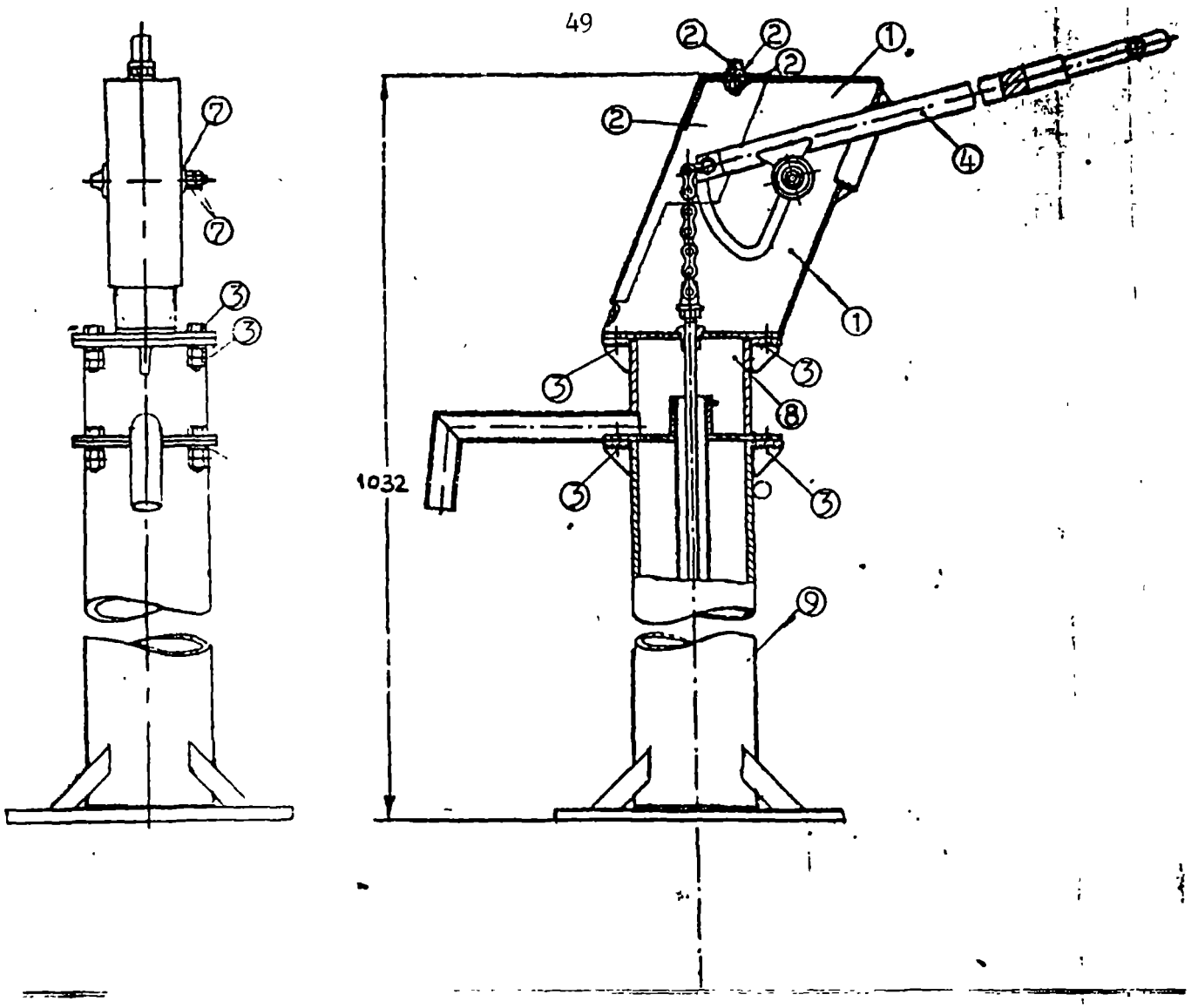
	Kakamega	Bungoma	Busia	Siaya
Dug wells/drilled wells				
Number of repairs	38/16	16/19	19/38	2/9
Total cost (KES)	7912/2335	2186/4010	2680/7600	480/2640
Cost/repair (KES)	208/146	137/211	141/200	240/293

It is observed that the present annual maintenance cost for a well is below 300 KES. Assuming a membership of 30 households per well, the cost per family is 10 KES annually.

The revenue for maintenance is supposed to be collected by the treasurer of the well committee. The revenue is divided into two parts.

1) Membership fee

All the members in the well supply area are required to pay a membership fee. The amounts of money paid vary but range from 10 - 20 KES per member.



Part No.	No. Off	Description	Price each shs
1	1	Head assembly	600/-
2	1	Front cover with bolt and washer	110/-
3	4	Hex bolts with nuts and washers	10/-
4	1	Handle bar with bearing housing and roller chain quide	480/-
7	1	Handle axle with nuts and washer	350/-
8	1	Water tank assembly	590/-
9	4	Stand assembly	1380/-

Figure 17. Price list of India Mark II (Kefinco 1985 a).

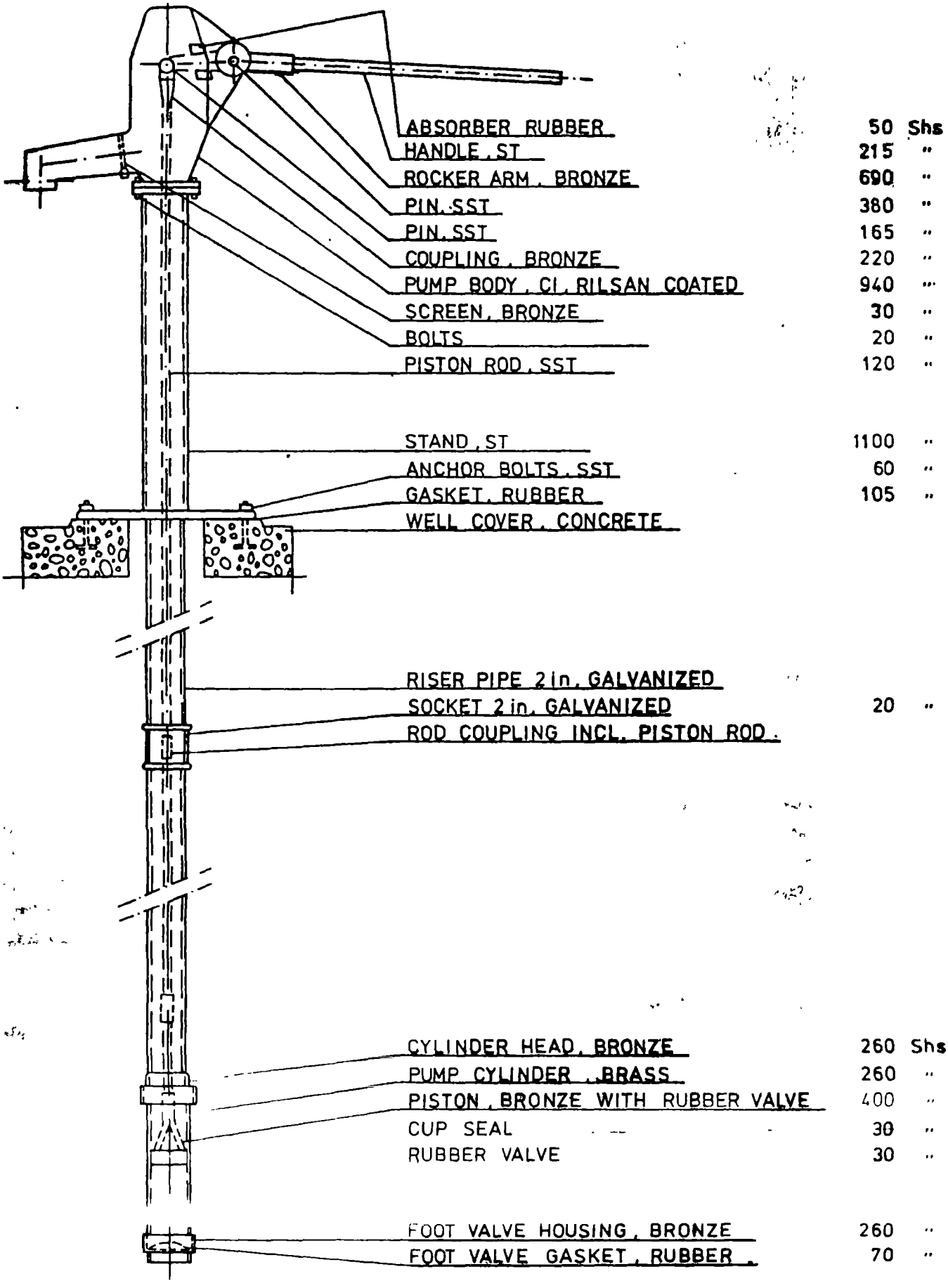


Figure 18. Price list of Nira AF-76 (Kefinco 1985 a).

The definition of a member is different in the well committees. Some well committees require the head of the family to be the member. In most of the families the heads of families are men. Other committees require each household to pay the membership fee, namely the women. The difference is that polygamy is a common practice in the project area and in cases where only the men pay for membership, a man with more than one wife will effectively pay only for one of his households.

The membership fee is supposed to exceed 1000 KES before the handpump is equipped by the project management.

2) Annual subscription

The amounts and the method of paying the annual subscription vary from one well committee to another. The amounts paid range from 6 - 12 KES per household per year, which means between 0,50 - 1,00 KES per household per month. This is quite a low price for reliable clean and safe water which nearly all Kenyan rural families can afford.

The methods used in revenue collection require a lot of improvement. Some households pay all the money required once a year, others pay a shilling now and then, while others do not pay at all.

The main observed obstacle in revenue collection is record keeping. Most of the well committees did not have records of all their members. Many of the records kept were not up-to-date and were on temporary books with pages missing. This unsatisfactory condition made many members suspicious.

During the field study in the project area the author proposed a format for record keeping to the committee members.

1) All the households in the supply area should be well documented.
2) The amount of money paid by each member and the time of payment should also be kept.
3) The records should be kept in permanent hardcovered books.
4) The records should be available to any member of the water project.

Figure 19 shows a possible way of record keeping. Depending on the annual subscription, it is possible to see who has paid his or her dues and who has not.

Well Number _____ Year _____

Name of committee _____

Chairman _____ Payment each month in KES

Location _____

No	Name of member	Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Total
001	A.B. Musyoka	1,00	1,00	1,00	1,00	1,00	1,00	1,00	1,00	1,00	1,00	1,00	1,00	12,00
002	C.D. Kamau	12,00	-	-	-	-	-	-	-	-	-	-	-	12,00
003														
.														
.	N.B. ...	1,00	-	1,00	-	-	-	3,00	-	-	1,00	-	1,00	7,00 (- 5,00)
.														
200														
.														
.														

Figure 19. A possible format for membership record keeping in the well committees.

During the dry seasons the well committees had more members. People were also more willing to pay their annual subscriptions. When the rains came people went back to the traditional sources. It is possible to see a woman collecting water from a road pothole while 500 m away there is a well or borehole with clean and better quality water. Figure 20 shows women collecting water from such pools during the rainy season.

Figure 20. Women collecting water from a pool in Busia District.

5 COMMUNITY PARTICIPATION IN RURAL WATER SUPPLY DEVELOPMENT PROJECTS IN MACHAKOS DISTRICT

5.1 Machakos Integrated Development Programme

5.1.1 Description of the project and project area

The Machakos Integrated Development Programme (MIDP) is a pioneering project in Machakos District, in terms of population the largest district in Kenya. This programme combines a concern for the development of Kenya's semi-arid areas with a district focused approach to planning and implementation.

The project started with phase I in 1978. During the phase I which lasted upto 1981, there was not much community involvement in the project. All the work was done by paid workers. Phase II started from 1982/1983 and lasts upto 1985/1986. During this phase community contribution especially in form of free labour has been emphasized. Phase III of the programme is expected to cover a period of four years starting from 1986/1987 to 1990/1991 (Machakos Integrated Development Programme 1983).

The government departments directly involved in the MIDP phase II are:

1) Water Development,
2) Agriculture Development,
3) Livestock Development,
4) Cooperative Development,
5) Rural Industry,
6) Forestry,
7) Social Services and Adult Education, and
8) Economic Planning.

During phase II of the programme the Kenyan government is expected to contribute 42,8 million KES or 21 % of the total project cost. The European Development Fund (EDF) is requested to contribute 163 million KES. The water component during this phase is 44 % of the total budget. Water related activities in the MIDP include:

- water supply development for people as well as for livestock, and
- water catchment areas protection and afforestation.

Machakos District has an area of 14254 km^2 and a population of over 1 million. The population distribution varies very widely with the densities of over 180 persons/km^2 in the high potential central areas and under 15 persons/km^2 in the lower, less fertile, more arid northwestern part of the district.

The annual rainfall averages are over 1000 mm in the northern hills and less than 500 mm in the south and southeast. According to the Ministry of Water Development classification based on annual rainfall, the district is divided into:

- 8 % high potential (over 1000 mm of rainfall),
- 18 % medium potential (750 - 1000 mm of rainfall), and
- 74 % low potential semi-arid (below 750 mm of rainfall).

There are not many permanent rivers in the district. Athi river which drains most of the district is the only major perennial river. Tana river, the largest river in Kenya, forms the northern boarder of the district. In many parts of the district there are seasonal rivers that are filled with sand. During the rainy seasons these rivers carry large volumes of water. During the dry seasons subsurface flows in sand river beds are significant. These form the traditional water sources in the district.

Springs are also limited to the high potential areas and on the Chyulu hills. The groundwater resources have not been studied.

There are no district-specific data on rural income levels. Table 8 gives the results of a rural survey on rural household income distribution for Eastern Province of which Machakos District is a part during 1974/1975 (Machakos Integrated Development Programme 1983).

Table 8. Distribution of rural households by income groups in KES, Eastern Province 1974/1975 (Machakos Integrated Development Programme 1983).

	Eastern Province (%)
Below 0	5
0 - 999	9
1000 - 1999	25
2000 - 2999	13
3000 - 3999	14
4000 - 5999	13
6000 - 6999	14
7000 and over	7
Total	100

5.1.2 Coordination between the Ministry of Water Development (Machakos office) and Machakos Integrated Development Programme

The organization chart in figure 21 shows the coordination between the Ministry of Water Development and the MIDP water component.

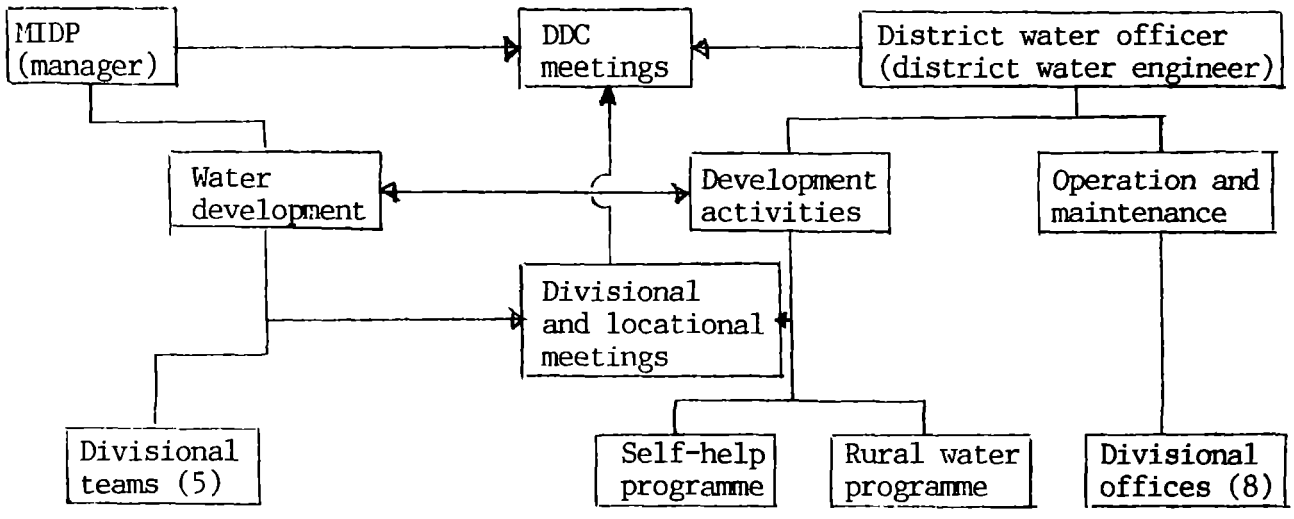


Figure 21. Coordination between MIDP and the Ministry of Water Development in Machakos District.

In the MIDP water department there are three categories of staff. These are:

1) Expatriates

Expatriates are mainly water engineers. Most of them come from West Germany. The head of the water department is an expatriate.

2) Ministry of Water Development staff

There is Ministry of Water Development personnel seconded to the programme. All of them are technicians or trainees from the ministry's training school.

3) MIDP local staff

The MIDP employs semi-skilled staff such as masons, mechanics, drivers and also office staff such as accountants, clerks and typists.

The field workers are divided into five divisional teams:

1) Yatta divisional team,
2) Kibwezi divisional team,
3) Kilome divisional team,
4) Makueni divisional team, and
5) Machakos based team.

The divisional teams are headed by technicians who are seconded to the MIDP by the Ministry of Water Development. Trainees from the ministry's training school are also attached to these teams for practical training.

The coordination of the activities of the MIDP and of the Ministry of Water Development is done by a senior technician who is seconded to the MIDP by the Ministry of Water Development. The district water engineer who is in charge of coordinating all water development activities in the district is always informed of the activities of the MIDP. The MIDP also shares the transport with the district office whenever the need arises.

Regular meetings between the various departments working in the MIDP are held. This makes it possible to work without duplicating the activities of the

departments with similar operations, such as the Ministry of Water Development and Department of Livestock in the provision of water for livestock or the Ministry of Water Development and the Forestry Department in a water catchment protection programme.

5.1.3 Water supply development

The MIDP is involved in construction of different categories of water supplies in Machakos District. These water supplies may be classified into

- small low cost water projects and
- high altitude dams with gravity pipelines.

Community participation exists in both categories of water supplies. Low operation and maintenance costs for the latter category of water supplies makes it be considered under low cost water supplies.

5.1.3.1 Small low cost water projects

Point water supplies are classified as small water projects in this programme. During the phase II, potable water will be provided to nearly 74000 people through small water projects. In the supply area small water projects include:

1) Sub-surface dams

Sub-surface dams are constructed in the dry parts of the district where perennial sandy rivers have traditionally provided water to the communities living in these areas together with their livestock.

Through the various development committees - locational, divisional and district - possible rivers are identified where some of the sub-surface dams can be constructed. The assistant geologists working in the divisional teams together with the local community leaders survey the identified rivers to determine the most suitable sites for sub-surface dams. In other cases the local community has formed a self-help group in order to contribute some money to construct a sub-surface dam in its area. If such a self-help group is in an area within the five divisional teams, the community gets MIDP assistance. In the dry areas the walking distance to a sub-surface dam water source is 2 - 3 km. In these dry

areas where the population density is under 15 persons/km^2, one sub-surface dam is expected to supply 200 - 400 persons together with their livestock.

In Machakos District these sub-surface dams are constructed using
- mortared rock walls and
- concrete wall.

When a suitable site for the dam has been identified, the community that has initiated the project is required to excavate across the sandy river bed upto the bed rock. The excavation is done during the dry season when the water level in the sandy bed is the lowest. The community uses buckets to dewater the excavation during the digging.

The semi-skilled labour such as masons and carpenters is provided by the MIDP during the construction of the sub-surface dam. When there is natural stone in the area suitable for construction, mortared rock walls are preferred to concrete walls. They are cheaper to construct and the community can participate more by collecting the needed stones during the construction.

The MIDP buys all the materials needed for construction. If the materials cost upto 10 000 KES, the divisional team leader buys without referring for clearance from the Machakos office. If the materials needed cost more than 10 000 KES, the purchases have to be approved at the Machakos office.

Costs of sub-surface dams depend on the materials used. Sub-surface dams made from concrete walls are the most expensive. In Machakos District the per capita cost of sub-surface dams with a well equipped with a handpump is 300 - 500 KES.

Water is obtained from the sub-surface dam mainly in two ways.

- Wells are sank in the sand reservoir behind the dam wall. Some of the wells have been equipped with handpumps. In others the community uses buckets to draw water. The wells are located at the sides of the streams so that the well sites are above the high flood level. These wells are hand-dug by the community. MIDP installs concrete rings in the wells to prevent the sand from collapsing.

- Horizontal perforated pipes are run into the sand upstream of the dam at a depth of 0,5 - 1,0 m above the river bed. These perforated pipes are connected

to a pipe passing through the dam wall to a tapstand downstream of the dam. In some cases cattle traps to supply water to livestock have also been provided downstream of the dam.

2) Hand-dug shallow wells

The well digging programme within the MIDP is being managed by two Dutch volunteers. This programme relies very much on self-help labour.

The users form well committees. The well committees through their locational development committee ask for assistance which includes handpumps and concrete rings needed for well lining either from the government or the non-government organizations.

The community selects the well site. Normally wells are located in places which traditionally have been excavated during the wet seasons to provide water. When the community gets to the water level, the MIDP provides concrete rings and all the construction materials that cannot be obtained locally. The MIDP supervises the completing of the wells. After the well has been completed, the MIDP installs a handpump to the well. The average depth of wells that have been constructed is 5 m. Already over 30 wells equipped with handpumps have been completed.

The community members operate and maintain their wells. The Dempster handpump has performed poorly and the community members felt that it was not the right handpump for Machakos.

5.1.3.2 High altitude dams with gravity pipelines

Earth dams are sited and constructed at high altitudes. Pipelines are then laid from dams to the low lying areas where water flows by gravity to the consumers.

The siting of large dams requires technical knowledge. Thus the community's capacity and capability of selecting the correct dam sites is limited. Siting and construction of the dams are done by the MIDP. Heavy machinery is used for the dam construction.

The reticulation system is also designed by the MIDP staff. After the pipeline routes have been marked the MIDP management approaches the local administration in order to mobilize the beneficiaries of the water supply to trench for the pipelines. For some time the community turns up in great numbers. Progressively the number of those turning up diminishes until after a month nobody comes. Additionally some of those turning up are either old women or young children who are not able to do any work. The MIDP's experience with community physical involvement in piped water supplies has been disappointing. In one project after one month a community with 100 members trenched only 300 m or 3 m per person per month. During the field study three causes were identified for this apathy from the community.

- During phase I those people who worked in the programme were paid. Similarly those working in other departments within the MIDP were also paid. In phase II some of the departments are paying while the water department is not paying.

- Some of the communities have had bad experience with piped water supplies. They argued that many times piped water supplies did not give any water. When water flowed some communities used all the water for irrigation while others suffered.

- Community participation within the MIDP did not seem well organized. The work of mobilizing the community was left to the field staff who did not have any training on how to handle the community.

Operation and maintenance of many of the piped water supplies posed serious problems to the communities, such as:

- The water was not treated although it was clear that the quality of water from the open earth dams was poor. Many of the water supplies did not have treatment plants while those with treatment plants lacked chemicals quite often.

- Some of the water supplies had over 60 km of pipeline running throughout the supply area with a number of control valves. Without properly trained persons to run these water supplies, there were often problems. The Ministry of Water Development was called from time to time to repair such water supplies. The ministry was also contemplating taking over some of the water supplies which were not being run properly.

Although there were a number of piped schemes that were operating quite smoothly, the MIDP management as well as the district water engineer recommended that large piped water supplies with treatment plants should not be left to the community entirely.

5.1.3.3 Revenue collection for maintenance and renewal of handpumps

There was no standard procedure to be followed by all the well committees in the exercise of revenue collection. The MIDP had only given guidelines regarding revenue collection. Each well committee was advised to collect 500 - 1000 KES annually for handpump maintenance and another 500 - 1000 KES annually that would be used to renew the handpumps.

From talking to a number of well committees it was clear that the money for the renew was not being collected. The main reasons why the money for handpump renewal was not collected were:

- Some well committees had only 30 members. For the members to contribute 1000 - 2000 KES annually for both maintenance and handpump renewal meant 30 - 65 KES per household annually. Some members of the community perceived this to be too high a cost of water from a well.

- The handpump make (Dempster) used in the wells has shown poor performance. The communities are not willing to have the handpumps renewed.

- The communities fear that the money so contributed may be embezzled because there was no proper record keeping.

During breakdowns the well committees report to the MIDP Machakos office. The maintenance team from Machakos moves and repairs the breakdown. The community is charged for the spareparts only.

5.1.4 Water catchment protection

In the recent past (about 30 years ago) there existed many permanent springs throughout many parts of the Machakos District. These springs originated from protected indigenous forests. They provided clean water to the inhabitants of the district. These springs exist not any more.

With a fast increasing population during the last 20 years (the population of Machakos District has nearly doubled since 1965), there has been an increased pressure on land, resulting in clearing of many forests. Some forests have been cleared for charcoal burning and others to give way to farming. As a result many springs have dried up.

Within the agriculture department of MIDP there is a soil conservation team that has a programme of stabilizing selected small catchments by means of terrace construction, cut off drains, gully stabilization and reclamation and tree planting. The soil conservation team has been educating the community on how to perform the above mentioned works. Women groups have provided valuable contribution through free labour. The MIDP has provided these groups with the trees for planting and at times the needed tools like wheelbarrows, spades and mattocks.

The sub-surface dams are also exposed to pollution from livestock moving on the sand bed upstream of the dam. Figure 22 shows a case of pollution by livestock. Figure 23 shows an open well for livestock next to a well. The quality of water in the open well was very poor and there was a risk of contaminating the well for human water supply. To prevent pollution of sub-surface dam water supplies, the community members in each water supply have been advised to fence the storage sand bed upstream of the dam.

Figure 22. Pollution of a sub-surface dam by livestock in Machakos District.

Figure 23. A polluted open well next to a protected well in Machakos District.

5.2 Non-governmental organizations in water supply development

5.2.1 Non-governmental organizations working in Machakos District

The NGOs with direct affiliation with a church organization working in Machakos District are:

- Catholic Machakos Diocese and
- National Christian Council of Kenya (NCCK).

The main non-church groups working in the district are:

- African Medical & Research Foundation (AMREF),
- Care Kenya and
- Freedom from Hunger.

There are interancy water development meetings held under the overall supervision of the district water engineer to coordinate activities within the water sector.

The high success rate among these organizations depends on:

- the high degree of community participation,
- the organizations are dominated by development conscious Kenyans who are determined to bring about meaningful and lasting changes,
- the organizations have experience in handling and mobilizing local communities by the nature of work they do among the communities.

In this study the work of Catholic church and AMREF are considered.

5.2.2 Roof catchment by Catholic Diocese of Machakos

The project covers the whole of Machakos District. First the community forms groups of at least ten households. The group then applies for assistance from the diocese. The assistance is in form of materials and qualified masons who can train the community's masons how to construct leak-proof concrete tanks.

The Diocese Development Office (DDO) is the implementing organ of the diocese. It provides the group with a mould for constructing the cement ring tanks. A trained mason who in turn trains a local mason during the construction of the first two tanks within the group is also provided. After this training the community takes over the construction of the tanks. The local mason is paid a nominal fee of 150 KES for each tank he constructs.

The cost of materials for completing a tank is 1500 KES. However, the diocese sells the materials to the community at a reduced price of 1000 KES. It also donates materials for one storage tank that has to be constructed at a public place within the community.

Many of the members of the community involved are poor. Each member cannot raise once the required amount of money enough for a tank. All the members of the community contribute a fixed amount of money for one member. After a specified time, which normally is one month, they contribute for another member. This goes on until all the members have a tank.

During the construction each member is required to provide for himself or herself the materials that can be obtained locally. These include sand, stones and water for construction.

Some communities do not have roofs appropriate for harvesting rainwater. In some parts of the district, such as Yatta Division, there are women groups that have decided to build iron sheet roofed houses that should facilitate harvesting clean rainwater.

5.2.3 Kibwezi Shallow Well Project by African Medical and Research Foundation

With the aid from the Netherlands, the African Medical and Research Foundation (AMREF) started a community health programme in Kibwezi Division of Machakos District. Community health workers from the community were recruited to work in the community health programme. These community health workers who were required to read and write English were given on-site training by AMREF. During this community health programme it was realized that many of the diseases prevalent in the area could not be eradicated without an improved water supply.

The shallow well project started in 1983 with a view to improve water supply in the area. The programme is funded by the Netherlands. The community health workers together with other community leaders mobilize the community within their area to form well committees. Well sites are identified. The community health workers organize the community in digging the well to the water level.

AMREF which has a store and also a concrete ring making apparatus provides the materials that can not be collected on site to the well committees. A local mason is appointed by the community to complete the well. The mason is paid by AMREF. Today 14 wells equipped with handpumps have been completed. According to the engineer in charge of the Kibwezi Shallow Well Project, the cost of a well consists of:

- construction materials	5 000 KES
- transport of materials	4 000 KES
- overheads	6 000 KES
- handpump and pipes	10 000 KES
Total	25 000 KES

One well has 200 - 400 consumers. The per capita cost of a well is therefore 65 - 125 KES.

The wells are operated by pump attendants who are nominated by their communities. The pump attendants who are mostly men are given training on how to repair the handpumps on site. The wells are operated at specific times. The pump attendant opens the handpump from 6 - 9 o' clock in the morning and from 3 - 6 o' clock in the afternoon. Other times the handpump remains closed. The well committees are required to collect funds for maintenance of their handpumps. Spareparts are available at Kibwezi's AMREF stores.

6 COMMUNITY PARTICIPATION IN KWALE DISTRICT COMMUNITY WATER SUPPLY DEVELOPMENT PROJECT

6.1 South Coast Handpump Project

6.1.1 Description of the project and project area

Traditionally the people of Kwale District and especially those living along the coastal strip have relied on groundwater for their water supplies. In this area there are over 150 open wells, some of which are more than 100 years old. The water is generally of good quality.

In 1981 Kenya confirmed its intention to participate in the UNDP/World Bank project for the testing and technological development of handpumps for rural water supply (Arlosoroff et al 1984). South Coast was selected as a suitable area for this project for the following reasons:

- Water table which is hardly 50 m below the ground level was ideal for handpump use.
- Groundwater supply was acceptable to the local community.
- Occasional outbreaks of cholera in the area made it necessary to protect the open wells.

This project is known as South Coast Handpump Project and covers Diani and Msambweni Locations of Kwale District. The area is 300 km^2 with a population of nearly 50 000 people.

The community living in the project area is predominantly Muslim. Unlike elsewhere in Kenya where each family lives on its own piece of land, the South Coast people live in villages of 20 - 200 households. With the family size of 6 - 8 persons per household each village has 120 - 1600 persons.

6.1.2 Project implementation

The project construction work took place from late 1983 to June 1985. The project was financed by a grant from SIDA chanelled through UNDP and supervised by the Ministry of Water Development and the World Bank group. The aims of this project were:

- To increase dependability and reduce costs of rural groundwater supply projects utilizing handpumps through the development and testing of simple reliable handpumps that can be produced locally and maintained at the village level.

- To provide low-cost point source water supplies to the rural communities through community involvement in decision making, construction and operation and maintenance.

The project had technical and community liason personnel. The work of community liason was done by two sociologists who were seconded to the project by a NGO called Kenya Water for Health Organization (KWAHO). The KWAHO sociologists were assisted by community based extension workers from the community. The community liason officers helped the community to form well committees which consisted of 5 - 9 members as follows:

- Chairman: The chairman could be either a man or a woman. The chairman did not need to know how to read and write.
- Secretary: The secretary was preferably a young man who could read and write the Kiswahili language.
- Treasurer: Older women were preferred for the post of treasurer.

The number of men and women for each committee was nearly the same.

The well committees together with the community liason personnel identified new well sites. All the new wells in the project were machine drilled. During the construction of the drilled wells the community provided construction sand and hard core. Over 80 handpumps were installed in about 70 new wells. Although nearly 150 traditional wells were identified, less than 10 of these were equipped with handpumps. There are two reasons why many old wells were not equipped with handpumps.

1) Most of the wells are large in diameter, some larger than 2 m. Therefore it was technically difficult to cover these wells. Figure 24 shows an old open well in South Coast.

2) The community had seen an earlier programme by the Ministry of Health and UNICEF based on covering the open wells and equipping them with handpumps, to fail.

The community felt that it would be left without any water supply if all the wells were covered and then the handpumps failed. It proposed that the wells would be covered once the people knew how to repair the handpumps installed in the drilled wells.

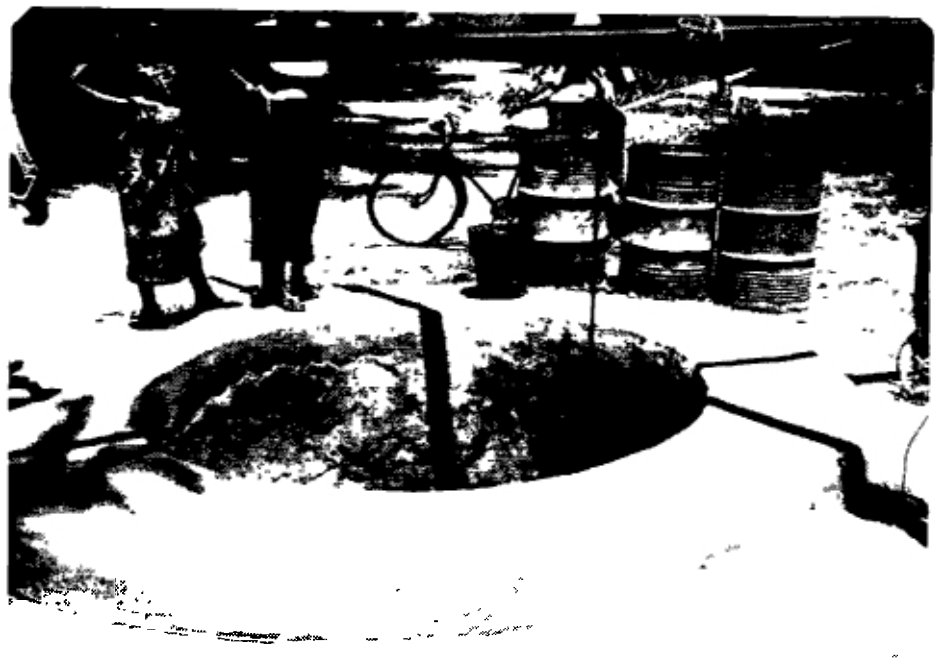


Figure 24. A traditional open well in Kwale South Coast. It was technically difficult to cover these wells with large diameters.

The average cost for a drilled and handpump fitted well is approximately 51 200 KES as shown in table 9 (Norconsult 1985).

Table 9. Cost per drilled well in KES in June 1985 (Norconsult 1985).

Item	Cost/KES
Direct cost per well (to average depth of 27 m)	17 600
Indirect cost per well	33 600
Total cost per well	51 200

Assuming 250 consumers per well the total per capita cost for a drilled handpump fitted well is just over 200 KES. Figure 25 shows a completed drilled well. Washing basins have been provided in each well.

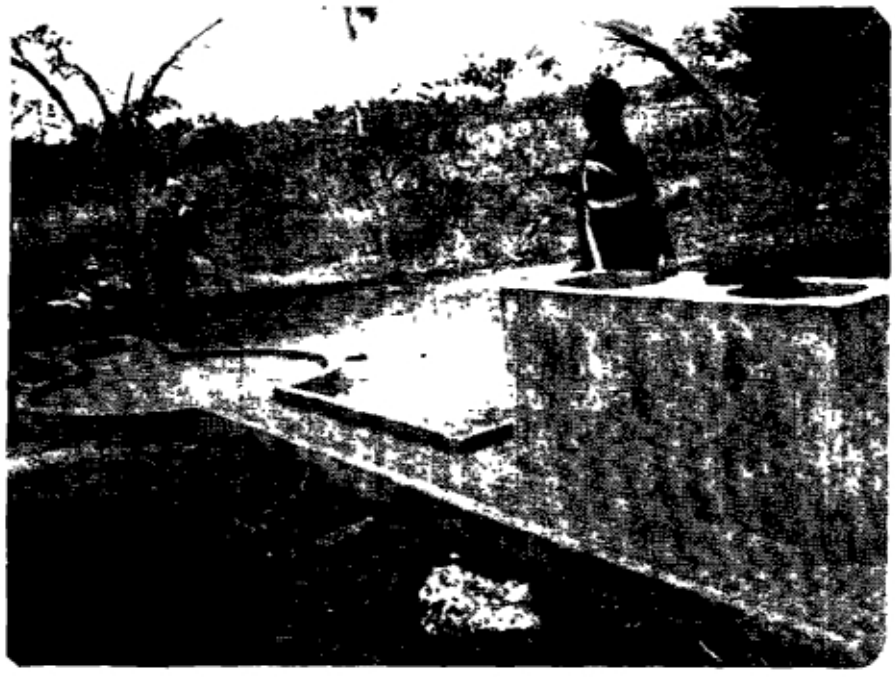


Figure 25. Washing basins have been provided in all the constructed wells in the South Coast.

6.1.3 Training of women for handpump maintenance

The project has decided to train women only as maintenance personnel. A number of well committees with villages near each other were asked to nominate a young woman of good character. The woman selected was to be a full time resident of the area and able to read and write. From the 80 well committees within the project area, 24 women were nominated. These women were given a two week theoretical training on the following:

- how to detect defects in handpumps,
- fast out-wearing parts of handpumps,
- working principles of handpumps,
- installation of handpumps in the well.

Besides these fields the women were taught other subjects such as water-borne diseases, communicating skills and book-keeping.

The theoretical training was conducted in a village polytechnic within the project area. Instructors to this course included KWAHO staff and the Ministry of Health staff in the district.

The practical training is still going on. The women are being trained in groups of five. The field training is being given by the UNDP maintenance team.

The community liason personnel reports the breakdowns to the UNDP maintenance team. This team has the names of the trainee women from the area where the breakdown has occurred. The women who have also been informed about the breakdown are collected by the UNDP team. Both the women team and the UNDP team repair the breakdown. In some cases the women repair the handpumps while the maintenance team watches the progress. The women teams are capable of repairing the handpumps. However, the women need more confidence in themselves. During the author's field study in the area, these women were often saying that they cannot work alone. They claimed that the work of handpump repairing requires physical strength. Figure 26 shows both the UNDP team and the women team during a handpump repair.

There were three factors that were hindering the field training:

- The water supply project has over 10 different types of handpumps. One women team might have to deal with three or more handpump types. This tended to cause confusion to the women. However, the project will install fewer handpump types after the field study is completed.

- The women work voluntarily in the project. They felt that they should be paid at least for the hours they spend in the maintenance work. Husbands or parents of these maintenance women also wanted them to be paid.

- Some of the community members questioned the choice of young women for handpump maintenance. They wondered what would happen when these women were married outside the project area.

Figure 26. A UNDP team and a women maintenance team repairing a handpump in the South Coast Handpump Project.

6.1.4 Collection of revenue for maintenance

Although the project is maintained by UNDP employed maintenance team, the well committees have been advised by the community liason officers to collect revenue that would be available for the handpump maintenance when the project was handed over to the community.

The amount of money collected from each household is between 0,50 - 1,00 KES per week. The money is collected on Fridays when the community members go for prayers in the mosque. By February 1986 some well committees had collected upto 4000 KES.

The money is banked in commercial banks within the district. KWAHO extension workers have been helping the well committees in opening bank accounts. Passport size photos are required by the banks from the account bearers. The extension workers have arranged with a photographer who moves from one well committee to another for these photos.

It is not clear how the money will be spent. The supply of spareparts for the handpumps has not been established. It is proposed that the spareparts will be purchased either from Kwale town at the distance of over 30 km from the project or from Mombasa town at the distance of 50 km from the project. It was not either clear how the women maintenance teams would be compensated. It is most likely that they would not be motivated if they worked for long hours without any form of reward.

6.1.5 Cleaning of well compounds

Well compounds in all the water supplies in this project are kept very clean. The grass is always cut short and all the rubbish burnt. The work of cleaning the wells is done either by women or by children.

The well committees have formed a roaster for the work of well compound cleaning. Each household has a particular day for the work. This roaster is pined on a notice board at the well compound or on a tree near the well compound. Families with small children delegate the work to the children.

Small vegetable gardens have also been established on the well compounds. The household nearest the well takes care of the garden. The proceeds from the sale of the vegetables go to the well bank account.

The community living in the area does not keep livestock and hence there is no need to fence the well compounds to protect them from animal waste pollution.

The community members normally wash their clothes at the well site. During construction washing basins were provided for each well. Water from the washing basin is drained away from the well site.

When the author asked the well committees why they kept their well compounds so clean, two reasons were given:

- The Muslim religion had a lot of influence on the ways of life of the community. To keep both wells and latrins clean is a way of life to a community of the Islamic faith.

- Malaria is prevalent in the area. Bushes and grass near the well compound are cut short to prevent mosquitoes from breeding.

6.2 Kwale District Community Water and Sanitation Project

6.2.1 Scope of the project

Kwale District Community Water and Sanitation Project started in July 1985. It is an extension of the South Coast Handpump Project and covers the whole district. Kwale District in Coast Province has an area of 8 250 km² and an estimated population of 350 000 inhabitants. The project has the following features (Norconsult 1985):

- limited inputs from outside in order to facilitate community participation,
- provision of assistance to organized communities that have expressed desire and shown commitment to participate in the project activities,
- simple suitable technologies that allow for on-going community based maintenance and repair of point source water supplies,
- local manufacture of equipment used for the water supply.

From a water resources viewpoint, the district is divided into four areas as shown in table 10.

Table 10. Principal project areas and water supply activities in Kwale Project (Norconsult 1985).

Area	Activity
Hinterland	Rainwater harvesting
	Drilled boreholes equipped with handpumps
	Construction of subsurface dams
Tsimba Hills	Spring protection and use of minor gravity reticulation
East of Tsimba Hills	Drilled wells equipped with handpumps
Coastal strip	Rehabilitation of old wells
	Construction of dug wells equipped with handpumps

6.2.2 Project organization and management

The project is being implemented by the "project implementation team" comprising of three main groups:

- health and community services,
- technical services,
- administration.

Figure 27 shows the organization chart for the implementation team. Presently the following organizations are participating in the project:

- Ministry of Water Development (MoWD),
- Ministry of Health (MoH),
- Ministry of Culture and Social Services (MoCSS),
- UNDP,
- SIDA, and
- Kenya Water for Health Organization (KWAHO).

With so many organizations it is questionable if the members from different organizations will work as a coordinated team. In the field there is going to be duplication of activities and a lot of underemployment, especially within the health and community services. The training and evaluation section alone has four university social science graduates. There are field extension officers who come from the area working under these graduates. From the Ministry of Culture and Social Services there are the community development assistants and the district community development officer.

During the author's field study in the area in February 1986, community mobilization was going on in the hinterland - far ahead of the implementation schedule. There was therefore danger of losing the communities' enthusiasm if the mobilization was not followed within a short time (less than 10 weeks) by the implementation.

Although the project is being implemented by government departments, the following factors not found within government organizations exist:

- The vehicles used in the project do not bear GK (Government of Kenya) number plates but ordinary private ones.

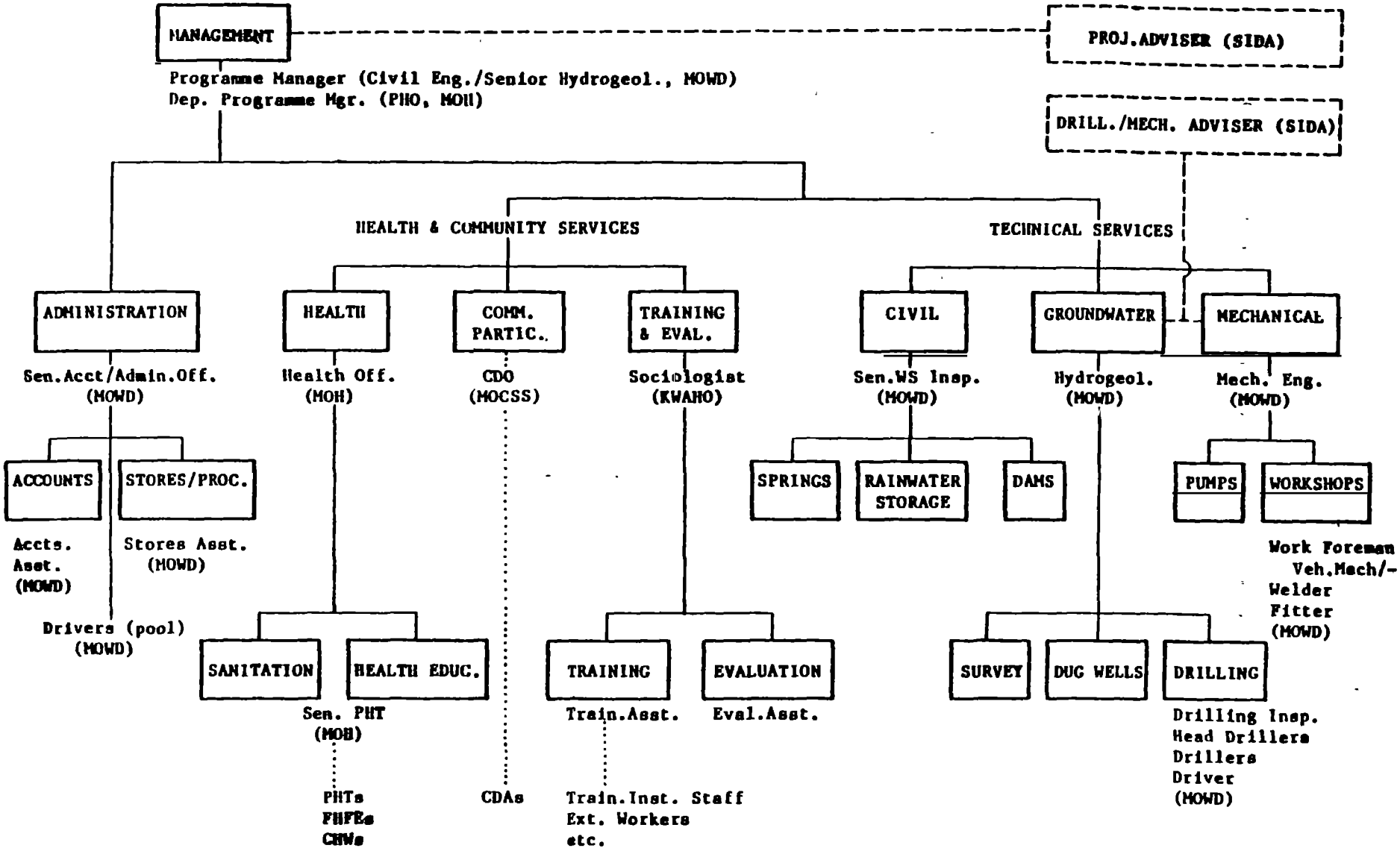


Figure 27. Programme implementation for Kwale District Community Water and Sanitation Project (Norconsult 1985).

- The government officers working in the project are allowed by the project management to drive the project vehicles.

There are advantages and disadvantages of such an arrangement. The project does not have to employ many drivers, which reduces the overhead costs of the project. However, there is a possibility for misuse of the project vehicles by the officers if proper control does not exist.

7 DISCUSSION ON STRENGTHENING COMMUNITY PARTICIPATION

7.1 Guidelines to improve community participation in the three projects

7.1.1 Community mobilization

In terms of providing the services to the consumers, the Western Project has been highly successful. The project has a well defined community mobilization strategy. This community mobilization includes:

- Preparing the consumers to benefit from the improved water supply. This is done by using audio-visual aids to educate the community on the relationship between water and diseases.

- Organizing the community to contribute to the development of the water supplies in its area. This contribution consists of time, labour and money.

- Arranging courses for community based pump attendants. These courses are organized to take place near the water supplies within the communities.

- Training of community based repair personnel.

- Involving the Ministry of Culture and Social Services in community mobilization. The ministry has a qualified personnel (especially women) to handle community members in community based projects.

It is therefore recommended that the community participation strategy adopted in the Rural Water Supply Development Project should be institutionalized in all community based water supplies. There should be only modifications to suit each community's conditions and cultural values. But as it is now each community based programme comes up with its own strategy merely to study if community participation is feasible. This wastes both time and money.

In the Kwale Project women were being trained to maintain handpumps. This approach was found by the author to have the following advantages:

- The women trained visited their wells every day to draw water. If there was a small problem with the handpump, it would be rectified before it became serious.

- When the women from the community saw their folk women repair handpumps, they also wanted to learn to repair the handpumps. Thus there will be more people in the community who know how to repair the community handpump. Men were also curious to see women doing what was thought to be a man's job. These men were willing to help the women in heavy duties.

In the MIDP the community was required to collect funds for maintenance as well as for replacing the handpumps after their economical life was over. In the other projects the community was required to collect only funds for handpump maintenance. The number of handpumps being installed in these projects was big. The Western Project alone plans to have nearly 7000 handpumps installed. To replace these handpumps after their economical life will require a large sum of money. These projects should therefore have long term plans regarding the role of the community in these water supplies.

During the field study it was found that the community liason personnel should be as close as possible to the community it serves. The community appreciates more officers who identify themselves with the community. If it is possible the officers should mix with the community formally and informally. In this project the community liason officers interacted with the community only at the official level. After the work the officers were driven to Mombasa over 50 km where they were staying every day although there were places to stay within the project. This also raised the cost of the project which was supposed to be a low-cost water project.

In community based water supplies what is needed is not a very highly qualified personnel either in sociology or in technology. What is needed is people who can live under the same environment as the community. If houses are not available in the project, the community liason officers should be able to stay in tents. This is what was happening in the Rural Water Supply Development Project in Western Province. The training team stayed in tents during the field work.

7.1.2 Coordination between the projects and the Ministry of Water Development

The activities of the MIDP and those of the Ministry of Water Development in Machakos District were well organized. There were regular meetings also between the various departments working within the MIDP which were necessary to avoid conflicting views about community participation within the programme.

Hence for effective community participation the different organizations and departments working within the community should work as a team. This is all the more important because the same community members involved in water supply projects are involved in soil conservation, school construction, health centre construction and food production. Without coordination between the different departments it is easy to constraint the community which might result in a negative attitude towards community participation.

A greater coordination between the Western Project and the Ministry of Water Development at both the districts and the province is needed. This could be through regular meetings between the project and the ministry's Provincial Water Engineer in Kakamega. During the author's field study in the project area, the community members would say to the project personnel in the field that they should come and provide them with water because they do not know when the Ministry of Water Development comes to construct a water project in that area. The community needs to be told that the Western Project is a government project and Kefinco was one of the government's agencies in water supply development.

A water body to be responsible when the implementation phase of these projects is over needs to be identified now. These projects cannot be left to the communities without a water agency to monitor parameters such as water quality, availability of spareparts and increase in water demand within the community and how to provide for this increased demand. This agency could be a government ministry such as the Ministry of Water Development, the Ministry of Health or the Ministry of Culture and Social Services which is in charge of all community based projects. The agency could also be a non-governmental organization.

7.2 Low-cost water supply development

The Ministry of Water Development needs to encourage the community in constructing low-cost water supplies. The main low-cost water supplies feasible in Kenya are:

1) Rainwater harvesting

All the government institutions such as schools, health centres and buildings in the rural areas should harvest as much rainwater falling on their roofs as possible. In schools the parents could be asked to make excavation for under-

ground tanks. They could also be organized to provide the locally available materials. The Ministry of Water Development through the locational development committees would provide the skilled personnel and the materials not locally available.

Other methods of rainwater harvesting include rock catchment and storage of runoff water under sand beds. These methods which are currently being implemented in Kitui and Machakos Districts could be extended to other areas.

2) Well construction programmes

The full groundwater potential of the country needs to be studied. Where the groundwater level permits, wells equipped with handpumps should be constructed. Groundwater often does not need treatment which makes it very appropriate for rural communities.

With community participation the per capita cost of water supply based on wells and handpumps in Kenya is between 100 and 250 KES. The average per capita cost of piped water supply is over 1000 KES - hence four to ten times more expensive. Since 60 to 70 % of the people would be supplied through a water kiosk in case of piped water, the level of service from such a piped water supply for the majority of the people is the same as from a well equipped with a handpump. The maintenance costs for a well equipped with a handpump are 300 KES per year. The operation and maintenance costs for a pumping piped water supply supplying 250 people at 10 l/h/d are nearly 2200 KES. (It is assumed that the operation and maintenance costs of water are 2,40 KES per m^3.)

3) Protected springs

Springs are the traditional water sources for communities living in the high rainfall regions of Kenya. These regions include Western Province, many parts of Nyanza Province, Central Province and some parts of Coast Province.

One of the disadvantages of springs is their poor accessibility. Springs could be made more acceptable to the communities as improved water supplies by using gravitation to deliver water to the communities living downstream of these springs.

7.3 Handpump development and availability of spareparts

There is a programme in the South Coast Project which is trying to develop a handpump suitable for community based water supplies. Kenya Industrial Estates together with the World Bank and UNDP have already produced one handpump which is going to be tested in the South Coast Water Project.

Nira AF-76 handpump is commonly used in Kenya in the Western Project as well as in Tanzania. It might be advantageous to produce the direct action Nira pump in Kenya or Tanzania. This would ensure constant supply Nira pumps which according to the findings in the South Coast Handpump Project are suitable for shallow wells of less than 20 m deep.

The India Mark II manufactured in the Western College of Arts and Applied Sciences (WECO) in Kakamega needs to be re-designed so that the handle axle can easily be removed when replacing bearings. As it is now, the handle axle jams in the head assembly hole. During the author's field study the handpump repair team had to use excessive force to remove the jammed handle axle when replacing the bearings. On one occasion the handle axle threads were destroyed by a heavy hammer used to remove it. Hammering also weakens other parts of the pump.

The availability of spareparts throughout the project areas would be enhanced if some shopkeepers were encouraged to stock handpump spareparts. Shopkeepers stocking bicycle spares would be ideal.

7.4 Non-governmental organizations

The per capita cost of water supplies constructed by NGOs is lower than that constructed by larger organizations. The per capita cost of a shallow hand-dug well by AMREF is less than 125 KES while the per capita cost of a similar well by Kefinco is over 400 KES. Therefore the role of NGOs in low-cost community based water supplies should be encouraged.

Some of the smaller NGOs have not been equally effective. The number of NGOs working within water supply development in rural areas should therefore be monitored because the poor performance of some of them could spoil the good work done by others.

Some NGOs, especially those from outside Kenya, have brought unfamiliar equipment in the country. When such equipment breaks down spareparts are not available. NGOs should therefore be advised to help rural water supplies with equipment that has spareparts locally available.

7.5 Upgradable water supply projects

In the Western Project some of the machine drilled wells give high water yields of upto 20 m^3/h. With a submersible pump such a well could easily produce over 100 m^3/d. The diameter of these wells is however small, only 100 mm. Wells of larger diameters (over 150 mm) should be drilled in public places such as markets and large schools. When electricity becomes available these wells in public places may easily be equipped with electric submersible pumps. Either more people than the estimated 250 persons per well would be supplied or more water would be supplied to the same people.

8 CONCLUSION

The current development budget of Kenya government is not adequate at present to supply piped water for the whole rural population estimated to be over 26 million by the year 2000. If the government's objective of providing an improved water supply to all by the year 2000 is to be realized, the rural communities must be mobilized to augment the government's efforts. Technologies to be used in rural water supply development need to be reviewed so that domestic resources like labour, materials and animal transportation could be employed.

From Kenya's past history in community participation the following inferences are made:

1) Water supplies that are imposed to unprepared communities are bound to fail.

2) If a community is forced to participate in water supply activities, eventually the water supplies will be neglected.

3) Communities need proper technical guidance in water supply development. If people without proper know-how are involved in water supply designs and construction, the water supplies will not operate properly.

It is therefore necessary to develop a strategy like the one used in the community based Rural Water Supply Development Project in Western Kenya.

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