

# Kilifi Water Supply Project

## Review of Project Proposal

By I O Oenga

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# 1 Introduction

NETWAS was requested to carry out a review study in collaboration with IRC, The Hague that had been approached by The Netherlands Red Cross. The basis of the survey was a proposal on Kilifi Water Supply Project (annex 7) that had been submitted by the Kenya Red Cross to the Netherlands Red Cross for financial assistance. NETWAS assigned its senior Public Health Engineer Mr. I.O.Oenga to carry out the field study from 10-18 August 1992.

## 1.1 Objective

The objective of the review/appraisal was to give recommendations on a short and long term strategy to improve the water supply in Mtwapa location. It was considered useful to include "Sanitation" as far as it relates to human waste (excreta) disposal in the TOR.

## 1.2 Background

The Kenya Red Cross Society (KRCS) in close co-operation with the Ministry of Health and with support of the Netherlands Red Cross Society (NRCS) is implementing a Primary Health Care (PHC) project in Mtwapa location, Kilifi district situated on the coast of Kenya. Mtwapa location has seven sub-locations and a total population of approximately 30,000 inhabitants. It is a large and scarcely populated area.

Preventable diseases linked with drinking water and lack of sanitation are among the major factors contributing to high infant and child mortality. Safe water supply is considered an essential element of the PHC programme in the project area.

In Kilifi district the main water "sources" are piped water, rain water and wells. The piped water supply scheme is the main line from Baricho serving Mombasa and the Tourist Hotels along the coast. The piped water scheme provides water at about 25% of the time. Walking distances for piped water can be up to 5 km. Rural areas have hand dug wells sometimes up to 150 ft deep and benefit from the piped water scheme despite frequent shortages. Many traditional hand dug wells were abandoned at the introduction of the piped schemes. Some boreholes and wells have saline water. Rain water is basically limited to surface runoffs with storage in ponds. KRCS has conducted a survey on fourteen boreholes and wells in the project area. Of these fourteen water sources, five had been abandoned and nine were in use. Of the boreholes or wells still in use at least six need repair or protection. Protection of the wells will prevent contamination, thus reducing health risks.

Roof rainwater catchment is difficult, as most houses have makuti thatch roofs. Rainwater is also prone to pollution through dust and bird droppings. In the dry season the water supply may become uncertain depending on the rainfall patterns, water use, storage capacity and the length of the dry period. The introduction of a three pot system may be considered as an option to improve the drinking water quality.

There is no clear answer for the water supply problems in Mtwapa. The Water Resources Assessment Project together with the Ministry of Water has planned to implement a preliminary feasibility Water survey in Kilifi district. The results of this survey will be available hopefully by December 1992.

The population of Mtwapa considers the improvement of water supply as a high priority and has requested KRCS to act as soon as possible. Therefore it has been decided to conduct a preliminary survey in the project area, to form a basis of water and sanitation activities .

The main activities of the KRCS in this area are Primary Health Care, with a mobile clinic having 9 centres. The water and sanitation activities are intended to be a major component in the PHC Programme. Initially KRCS hoped to work with GTZ, to develop groundwater sources for water supply which hope has not materialised to date.

### 1.3 Description of Activities

#### 1.3.1 TOR

A detailed TOR and Work Programme was prepared in close consultation with the KRCS as here below. The field analysis will include:-

- A general review of the existing situation concerning water supply in Mtwapa location
- An assessment of conditions of selected wells and boreholes (quantity, reliability, quality) and possibilities for improvement including a preliminary cost estimate;
- Water analysis of selected groundwater sources for the parameters: Fluoride, Iron, Salinity and pH. Bacteriological Parameters: MPN of the faecal coliform density. The Government Chemist Mombasa will be approached to carry out the analysis at a fee.
- A review of other alternatives for improved water supply for the location both short and long term
- Rapid assessment of potential for increased involvement of population, in particular women, in all phases of water supply improvements<sup>1</sup>
- Rapid assessment of local organizations technical and financial capacities in view of management of improved water supply systems<sup>1</sup>
- A preliminary review of water use
- An assessment of conditions of selected sanitation options (quality of construction, use and maintenance) including a preliminary cost estimate
- An assessment of the general hygiene practices and health situation

#### To Prepare a Final Report Covering

- The issues undertaken in the field survey
- An indication of possible health risks of prevailing water quality problems
- Suggestions for improved water supply for Mtwapa location
- Possible suggestions for further review and analysis

Note: Suggestions given for short term and also the long term improvements should be within the financial means of the project

### 1.4 Methodology

#### 1.4.1 General

The investigator shall employ participatory approaches. These shall include village mapping, observations, interviews with villagers, elders, women group discussions and government officers. The DWE, Chiefs, Assistant Chiefs will be interviewed.

Review of records in health institutions, rainfall data, and other hydrogeological data will be done. Discussion with DWE on current and future plans as they relate to Mtwapa shall be sought. WRAP, GTZ plans for Kilifi will be considered in their respect to Mtwapa location.

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<sup>1</sup> The two aspects were retained in the TOR as they were considered important for the sustainability of the improved water sources

In Kidutani sub-location a number of water sources were visited. Group discussions with villagers were conducted at Mtepeni, Miembekumi and Tunzanani. A village map was drawn and a group discussion with women was done at Lutsanga (Benesi) village.

In Mtwapa and Shimo la Tewa sub-locations, one group discussion was done at Mohamed Ahmeds well. At all the other sites individual interviews were done. At Juba Bakari's well a discussion was held with a group of women who were drawing water.

In Kanamai sub-location, a short meeting with the elders was held at the Majengo well. In Mwendo wa Panya sub-location a public meeting was held, where 24 women and 15 men attended. In Jhuri sub-location two separate meetings were held, one at Kisima cha Nyati and the other at Msumarini.

Observations on the water sources, housing, agricultural activities, pit latrine and water storage facilities in the houses were done. The physical condition of the water sources was noted. Samples for water analysis was taken from 7 wells, 1 pond and the river. These were sent to the Government Chemist Mombasa on the same day for chemical analysis. Results are in Annex 3. Fluorides and bacteriological examinations were not possible at the Government Chemist Mombasa, due to lack of reagents.

A report covering issues observed and discussed during the visits to the sub-locations was prepared. This report was presented during a one day analysis workshop, attended by two participants from each of the six sub-locations visited. The participants were selected by their respective communities.

#### **1.4.2 Analysis Workshop**

A one day analysis workshop was held at the Kanamai Conference and holiday centre. In all 17 participants attended comprising of Mr Amos Odongo of KRCS, Nairobi, Mr Johnson Chigogo Mwangala, KRCS, Field Officer at Mtwapa, 5 women and 10 men.

An overview of the field findings were presented to the workshop participants. The participants were then divided into groups representing their sub-locations, to discuss the validity of the information gathered. They were also requested to discuss the issues of water problems, choice of technology, duties and responsibilities of the "Partners in Development". Each group then presented their deliberations to a plenary. The group recommendations were synthesized and are recorded in section 3 of this report. The day's programme is in Annex 6 and list of participants in Annex 5.

#### **1.5 Tentative Work Programme**

The Tentative and Actual work plans are attached as Annex 2.

## 2 Findings

### 2.1 General

Mtwapa location is in Bahari division of Kilifi district Coast Province. The ethnic group is predominantly Miji Kenda. The religious norms here are mainly Islam with a fair percentage of Christians. The communities are basically farmers with some small commercial activities along the Mombasa-Malindi road. Large beach hotels exist here, but seem to have little economic impact in the community. Mtwapa location has seven sub locations Kidutani, Mtwapa, Shimo la Tewa, Kanamai, Mwendo wa Panya, Jeuri and Mawamba.

#### 2.1.1 Socio - Economic

The Mtwapa community is a rural community living along the Kenyan North Coast. Mtwapa market, the locational headquarters is 25km north of Mombasa on the main tarmac road to Malindi.

The main ethnic group is the Miji Kenda, basically practising peasant farming mainly for subsistence. The major crops grown are maize, millet, beans and greens. Some fruits are also grown. Livestock is kept in small numbers, while poultry is kept for home use.

The main economic activity is small scale business with the men seeking day wage employment away from their homes. The wages are low causing, a hand to mouth way of living. A discussion with the well diggers indicated that they prefer payment for the day's work to enable them feed their families at the end of each day. This makes saving patterns highly irregular, and may jeopardise the O&M of sophisticated water installations, such piped schemes, diesel and electrical pumping units.

Benevolence is taught by the two main religion groups in the area, the Islamic faith and the Christian faithful.

The Organisation structure composes mainly of the local administration led by the Chief and the Assistant Chiefs. Also religious groups have large following, and well established in the community. The Parents Teachers Association exist for each of the Primary and Secondary schools in the area. The Mtepeni-Mwatundo self-help water project committee is an institution formed voluntarily by the community.

Water sources especially wells have always been developed privately by the individual. In most cases the indigenous developers allowed neighbours to get water from their wells. Recent developments where Immigrants have developed water supply for irrigation purposes, do not allow neighbours to get water from their wells. This phenomenon is on the increase and may undermine the good benevolence that has so far been enjoyed in the community.

Ownership of developed facilities must be cleared before any developments are done. It may be useful for the project to allocate 10% of its budget to assist private individual developments at cost.

#### 2.1.2 Water and Sanitation Overview

The four main sources of water identified in the area were individual shallow wells, piped water supply scheme, seasonal ponds and a permanent river. Some of the private shallow well owners allow neighbours to draw water. Sometimes a fee of 50 cents per 20 litres is charged. Piped water scheme from the Baricho Water Supply serves Mombasa, Malindi and Kilifi. This source

is dwindling in rural Mtwapa due to increased demand both at Mtwapa market, Mombasa and the other larger towns. Seasonal ponds which retain rainwater dry up sometimes in the year. The Kidutani sub-location, has one permanent river, Mto Mkuu.

### **2.1.3 Water Resources Assessment Project (WRAP)**

The Water Resources Assessment Project (WRAP) is funded by The Netherlands government and will cover the whole district. The WRAP activities should have started in July 1992. However upon an agreement entered between Kilifi Water and Sanitation Project (KIWASAP) and (WRAP), WRAP started to undertake ground water analysis in Ganze and Bahari divisions in February 1992. The ground water analysis report is expected in September 1992. Preliminary draft findings are indicated in Annex 1 - Chemical Analysis of well water samples (Mtwapa Location).

### **2.1.4 Kilifi Water and Sanitation Project (KIWASAP)**

The KIWASAP, funded jointly by GOK/GTZ is in its Phase II covering Bamba, Digiria locations in Ganze division, Kayafungo, Mwanamwinga locations in Kaloleni division and Chonyi, Mwarakaya locations in Bahari Division. The Phase I spent Ksh. 5.5 million between 1988 to 1990. The current Phase II is intended to run between January 1991 to December 1993, spending a total of Ksh.30,000,000/-.

The Physical improvements carried out by the Programme include rehabilitation and augmentation of water pipelines, rainwater harvesting, shallow wells and building of ponds. Community participation is promoted, and hygiene education thought. VIP latrines are advocated for human waste disposal. Offset superstructures to enhance emptying of pits by hand driven emptying device is being tried out. The current Work Plan was drawn during a ZOPP workshop in May 1992. An evaluation of the project is intended for late 1993.

### **2.1.5 Other Activities**

AMREF is active in parts of Kaloleni division, while IFAD intends to have activities in the Arid and Semi Arid areas of the district. The Magarini Settlement Scheme has some water activities independently. The National Water Conservation and Pipeline Corporation manage the Sabaki (Baricho) water supply which serves Malindi, Kilifi and Mombasa.

Mtwapa market and its environs gets water from this water supply. Due to increasing demand in the larger towns as well as in Mtwapa market, the demand is outstripping the supply. Alternative sources are necessary.

## **2.2 Kidutani Sub-location**

Several water sources were visited in Kidutani sub-location. Those that accompanied me were Mr Johnson Chigogo Mwangala - KRCS, Mr Simion A J Ngome - Asst. Chief, Mr Moses Pekeshe - Chairman Mtepeni/Mwatundo self-help water project and Mr William Mamba.

### **2.2.1 Mwangaluka Pond**

Serves about 20 households. It is situated in rice fields. The pond is said to have been in this place over 50 years, according to Mr Moses Pekeshe (57 years old). The pond is open and can be heavily contaminated. It dries up in the months of March. The water is used for domestic purposes, sometimes including drinking.



### **2.2.2 Abu Zai Dani Muslims Centre**

This has a hand dug well 115 ft deep with a windlass as lifting device. As with all other wells this well is lined all down and has a heavily built well head, and is open. It is hoped that this well will be fitted with an electric pumping unit. The well was built in 1991 and the public is allowed to draw water free of charge. A sample was taken from this source for analysis and results are in annex 3 (sample No.114). Three 1m<sup>3</sup> GI tanks receive rainwater from the roof within the compound.

### **2.2.3 Mtepeni/Mwatundo Water Project**

A piped scheme 2" pipe was done in 1985 with the help of the Rotary Club of Kilindini. A connection was taken from near the KARI premises to Mtepeni primary school about 5km away. A kiosk with 4 taps was built and this supplied water for 2 years. It has since run dry and the community do not know why the water stopped flowing. They neither have made no effort to check with the water supply authorities as to what could be done to restore the supply of water. During the implementation of this project the community contributed labour only.

Currently, the community has formed a water committee, contributed Ksh. 15,000/- in order to get a connection from another point some 5km away, this time ahead of the heavy consumers. They hope that this will ease their water problems. They have however not consulted with the water scheme authorities if this will be possible. No consideration has been made of the fact that demand may exceed supply and the community has not considered alternative water sources.

### **2.2.4 Miembekumi borehole**

At Miembekumi a borehole (approximated depth 120 ft) fitted with a Kijito Wind Pump 16ft rotor stands abandoned (out of order) since 1990. An inscription on the plinth reads "Tanks and plinth by Ferrocrafit Kilifi, 1983". Ownership of the borehole could not be established, neither could be the precise year of construction from the community. The elderly men and women who were at this site indicated that the borehole was sunk by a (Mzungu) German, then handed over to the community in 1944, while others said it was built in 1983. Neither of the two views could be confirmed independently. The plot on which the borehole stands is said to belong to a local church. The master meter reading was 0547m<sup>3</sup>. Three ferrocement storage tanks (1.5m diameter by 1.6m height), two broken down washing slabs and two broken down bathrooms are seen at this site.

Currently the community gets water from a Mr. Hussein well free of charge. A private well under construction 50 m away. A full chemical analysis of the water quality is recommended to ascertain if the water is suitable for domestic use. Kijito Windpumps co. could be requested to provide a quotation for the rehabilitation of the wind pump and the borehole as necessary.

### **2.2.5 Mto Mkuu**

This is a river that discharges into the Mtwapa creek. It borders Kidutani in the North before flowing into the Eastern side of the sub-location. It is the only perennial surface water source in Mtwapa location. It flows through cultivated fields and thus attracts heavy contamination. A sample analysis was taken from this source and results are in Annex 3 (sample No.112). It serves as source of water to the Kidutani and Lutsanga villages.

## **2.2.6 Lutsanga (Benesi) Pond**

Due to an acute water shortage in Lutsanga village, the community had dug an open pond in 1982 which collects rainwater for domestic use. The source is heavily contaminated as it collects water from cultivated fields. It dries up during parts of the year forcing this community to walk up to 5km to fetch water from Mto Mkuu. The pond is in Mr Kombe Mangale Wambua's shamba. A sample was taken from this source for analysis and results are in Annex 3 (sample No.110).

No hand dug wells are in this village primarily because of two factors. First, the cost involved of digging ksh. 800/ft are prohibitive and secondly, the villagers fear that the underground water might be salty. Preference for water by women was open surface dams as hand dug wells may have low yields causing long waiting time.

At this water source a community meeting was held. A total of 32 people attended, 14 women and 18 men. A sub-location map was drawn from which water preferences and current source was mapped. A privately owned Benjamin's handdug well supplements this source during the drought. The water is said to be saline. A sample was taken from this well for analysis and results are in Annex 3 (sample No.111).

## **2.2.7 Institutional Sanitation**

In Mtepeni Primary School, the number of pit latrines can be said to be adequate for the 700 pupils and 16 teachers. The use is poor as faeces was all over the floor. While the mud floor is difficult to clean the mud walls and GI roofs were in poor state off repair. The soils here are firm and do not collapse easily.

In Tunzanani Primary School, there is an inadequate number of pit latrines. Those currently in use are poorly constructed and maintained. Lots of faeces was on the mud floor which are difficult to keep clean. The soils in this school are dispersive and collapse easily.

## **2.2.8 Household Sanitation**

Many of the household latrines visited are made of mud floors, mud/pole walls and makuti thatch. In several homes the pits had collapsed due to poor soils. Bathrooms wherever they exist were in a poor state of repair. Houses were poorly ventilated. Water storage containers in the houses were often uncovered and houses had earth floors.

## **2.2.9 Water in Schools**

The two primary schools Mtepeni and Tunzanani have adequate GI root area to sustain rainwater harvesting.

## **2.2.10 Individual hand dug wells**

Several hand dug wells exist in Mtepeni and Kinunguni villages. A general overview of the water quality can be seen in annex 1 of sampling done by WRAP indicating that the groundwater quality in this area is of fair mineral composition.

### **2.2.11 Recommendations - Kidutani**

The Kidutani sub-location has one Water Committee intended for the Mtepeni/Mwatundo Water Project, a clear indication that the people in this area have realised their water problems and have organised themselves to solve the problem.

In view of the prohibitive capital costs of piped water supplies, it is recommended that:-

- i) The Miembekumi borehole be repaired. It is assumed that a new well may be necessary
- ii) Rainwater catchment systems be installed at the two primary schools Mtepeni and Tunzanani
- iii) Rainwater Catchment (surface runoff) be harnessed at the present site of the Lutsanga (Benesi) Pond.
- iv) A shallow well be built at an appropriate point near the Mtepeni Primary School.
- v) Sanitation facilities be improved at the two primary schools Mtepeni and Tunzanani.

### **2.3 Mtwapa Sub-location**

The visit to Mtwapa sub-location was done on 12/8/92. A total of 5 hand dug wells were visited.

#### **2.3.1 Mohamed Ahmed's Well**

This well was abandoned some 5 years ago due to the excessive corrosion of the support reinforcement, which currently hangs precariously over the well. The well is situated 10m off the Jumba ruins road on Mr Mohamed Ahmed's shamba. The well was dug in the 1920's by the original Mzungu owner of the shamba. It is about 70 ft deep.

Nearby is a communal stand pipe from the Sabaki (Baricho) water supply, where consumers pay 20 cents/20 litres. The standpipe is run by an individual who pays the water bills at ksh. 3.65 / m<sup>3</sup>. Vendors abound and one vendor interviewed said he delivers water to nearby households at 80 cents/20 litres. Those met at this point included Messrs Mohamed Ahmed, Omar Salim, Kassim Mwajita and Karisa Menza. The water was said to be of good quality.

#### **2.3.2 Khamisi Athuman's Well**

The well is about 50 ft deep. It is hand dug and currently in use but requires cleaning. Mr Khamisi Athumani who we met at this site indicated that the well was dug in the 1930's. This well had recent label in red W494. The community did not know why the well was marked. The well was marked by WRAP as later explained to me by WRAP staff. Water here is drawn without any charge. A sample was taken from this well for analysis and results are in Annex 3 (sample No.115).

#### **2.3.3 Mtwapa Mtaani (next to the Mosque)**

Two hand dug wells exist here. Both are about 40 ft deep and in use. One of them dries and the other does not. Both wells are in a Mr Harabu's shamba, and approximately 30m apart. Mr Aula Ali indicated that about 50 people get water from this source. These two wells have too got labels in red W 458 and W 459. Water here is drawn without any charge.

#### **2.3.4 Mtwapa Barani**

The well about 50 ft deep here belongs to Mr Khamisi Abdallah. Water is drawn without any charge. It serves several neighbours around. Nearby a neighbour is digging a new individual well. A discussion with the three diggers indicated that the digging is sub contracted to them at Ksh.70/- each per day from the main contractor who may be charging as high as 1000/- per foot as indicated by the diggers.

### **2.3.5 Mtwapa Barani Mosque**

This well is near the Barani Mosque it is about 40 ft deep. The sides are heavily eroded. The well is in use by the surrounding community.

### **2.3.6 Observation**

All the wells visited in Mtwapa sub-location are private wells and ownership rights need to be discussed before any of them is developed.

### **2.3.7 Recommendations - Mtwapa**

In Mtwapa sub-location the majority of the shallow wells visited are within 15 minutes walk of each other. And this area is in the proximity of Mtwapa market, making the piped water supply more reliable than in the rest of the location.

It is recommended that one of the existing wells be improved. The choice should be by the community taking into account accessibility by the community. Rainwater catchment systems and sanitation facilities be provided to Mtwapa Primary School.

## **2.4 Shimo la Tewa Sub-location**

The visit to Shimo La Tewa was done on 12/8/92, on the same day as the visit to Mtwapa Sub-Location. Two wells were visited, Mtomondoni and Mr Ali Said's.

### **2.4.1 Mtomondoni Well**

This is a hand dug well, with a covered well head and is 70 ft deep. An old hand pump is out of order and water is drawn by rope and bucket through a manhole.

Mzee Salim Shokoa Sudi indicated that this well was dug by a Mhindi in 1992 before Mr Juba Bakari the present owner bought the shamba on which the well stands. Neighbours draw water without charge. According to Mzee Sudi, the owner of the plot Mr Bakari is selling off his shamba. He (Mr Bakari) has set aside the well and the portion on which the well stands for communal use. He is not selling this portion for fear that the new owner may not allow communal use of the well. This well is in use, without charge. A sample was taken from this well for analysis and results are in Annex 3 (sample No.116). This is a suitable well for development.

### **2.4.2 Ali Said's Well**

This well is about 60 ft deep. Has a low yield, and belongs to Mr Ali Said. The well has experienced caving in and urgently needs strengthening. This well is for individual use.

### **2.4.3 Observation/comments**

The two wells are five minutes walk apart. Mzee Sudi and women from the village made three observations which I consider note worthy:-

- (i) The issue of ownership: Most of the wells are on private land, despite their communal use. Land tenure practices as well as the cultural norms, may need to be ironed out before any investments are done, ownership needs to be addressed to.
- (ii) He asserts that women prefer and are used to sources where several of them can draw water simultaneously. The issue of hand pumps and taps which cause them to queue is therefore not the women's priority. This was correlated by an invitation by Mzee Sudi to a broken waterpipe nearby where 8 women were seen drawing water. An observation indicated that some of the women went past the shallow wells to fetch water from the broken pipe.

An interview with the women gave two reasons for preferring the drawing water from the broken pipe. These were quality, well water is saline compared to tap water. And secondly convenience as they don't have to pull the water up from a deep well.

- (iii) Reliability: One woman observed that whatever improvements that are to be done must allow people to have access to water whenever such devices breakdown.

#### **2.4.4 Recommendation - Shimo la tewa**

In Shimo la Tewa sub-location the Mtomondoni shallow well (Juba Bahari's) is a few minutes walk from Mtwapa market. The piped water supply here is less erratic and the well has a concrete roof with an opening

In view of these, it is recommended that a new well be dug at Mzambarauni, to serve the remote community. Rain water catchment system and sanitation facilities be provided at Mtomondoni Primary School.

### **2.5 Kanamai Sub-location**

One hand dug well was visited in Kanamai location on 13/8/92.

#### **2.5.1 Majengo Well**

This well is 50 ft deep and was dug in 1950. In 1979 piped water was provided to this village, leading to the abandoning of this well. The well has been marked W 97 in red. The well stands on public land and is fenced. Piped water is erratic, leading to a frequent cleaning of this well by the villagers. Depending on the seriousness of the water shortage, water costs up to Ksh.10/20 l. Individual wells include those of Messrs Rama, Peter, Salim, Yusuf and one at the mosque. A meeting with several elders at this well including Rev. Charles Lewa at East Africa Pentecostal and Omarhyder Mbogo Konde, was held. They indicated preference for technology as motorised put which rate of pumping may exceed the recharging of the well. A wind pump with storage and a hand pump. The community's ability to O&M the improvements shall be the determining factor, favouring a wind pump. The well is said not to dry. A sample was taken for analysis and results are in Annex 3 (sample No.119).

#### **2.5.2 Recommendation - Kanamai**

In Kanamai sub-location one well was visited at Majengo village. The well is a government land. It was abandoned in 1979 due to the introduction of piped water. The community have recently fenced this well, and elected a committee. The piped supply is erratic causing the community

to have cleaned the abandoned well. The cost of water during shortages goes up to Ksh 10/20l delivered. Several individual wells exist in this village.

It is recommended that the Majengo well be improved, fitted with a windpump, storage facilities and an organisational structure be strengthened for O&M.

## **2.6 Mwendo wa Panya Sub location**

One hand dug well was visited in Mwendo wa Panya sub location.

### **2.6.1 Barani Primary School Well**

Barani Primary School has 839 pupils and 23 teachers. The well here was built in 1975 and has been abandoned for a few years due to dirt. Alternative wells exist nearby. The school pit latrines have concrete floors, block walls and GI roofs. Two stances for boys, two for girls and two for teachers.

The school water and sanitation needs improvement. The well requires cleaning and development while pit latrines need to be added. A sample of water was taken for analysis and results are in Annex 3 (sample No.120). The well is in the school compound and has therefore a high probability of being communally used. The school building roof area may be used for the well recharging during the rainy season to improve on water quality.

A baraza was convened in Mwendo wa Panya village where 24 women and 15 men attended. Among the issues raised by the community was the cost the reliability of piped water. The women preferred a windpump with a storage tank. The introduction of piped scheme led to the abandoning of the traditional water wells. The unreliability of pipes and cost is leading to a desire for the revival of the abandoned water sources. The development must be such that is locally maintained and affordable.

### **2.6.2 Recommendations - Mwendo wa Panya**

In Mwendo wa Panya one well at Barani Primary School was visited, this well is abandoned. A meeting with the community indicated that they prefer hand dug wells as they are more reliable and cheaper O&M compared to piped schemes.

It is recommended that the Barani well be improved and another well (new) be developed at a site convenient to the community. Rainwater catchment system and sanitation facilities be provided at the Barani Primary School.

## **2.7 Jeuri Sub-location**

Two hand dug well were visited in this location.

### **2.7.1 Kisima Cha Nyati**

The well was dug in 1990 according to Ali Salim Mwidani born in 1924 in the area. A meeting at this site included 5 women and one man. The well is about 40 ft deep, serving over 100 households when piped water breaks down. This well is situated on a demarcated public land. A sample was taken for analysis and results are in Annex 3 (sample No.118). The well requires deepening and development. The community is willing to undertake the O&M responsibilities. A wind pump and storage tank may be necessary. However the piped scheme must need complementary sources. Several individual well exist in this area.

### **2.7.2 Msumarini Well**

With the introduction of piped scheme, the community deliberately backfilled this well. It is abandoned and dry. Realising that piped water shortages are frequent, the community craves to revive this traditional source. Already efforts to clean up this well are under-way and support together with other development aid is necessary to provide a water drawing device and storage. The well is in Msumarini Secondary School.

The Msumarini Secondary School has a pit latrine built in 1976 and are now collapsing in the foundation. Adequate and new latrines will be an asset in this school.

### **2.7.3 Recommendations - Jauri**

In Jauri sub location the Kisima cha Nyati was visited. It stands on public land and was dug in 1910. It requires deepening and general development. A piped supply serves this area, and this well is used mainly during water shortages. This shortages are likely to be more severe as the demand for water increases. Several individual wells exist in this area.

Another well, Msumarini was visited. This is probably the most dramatic of all cases of abandonment, where upon the introduction of the piped scheme the community deliberately backfilled this well. Shortages, cost of the piped scheme water is bringing back the realisation that the community needs this well back in operation. The community intends to clean and put this back to operation again.

It is recommended that both wells the Kisima cha Nyati and the Msumarini well be improved. Rainwater catchment systems and sanitation facilities be provided at Kikambala Primary and Msumarini Secondary Schools.

## **2.8 Mawamba sub-location**

The Mawamba sub-location has recently received assistance to develop its water supply/information: Mr Rodgers Mwalimu Tungu - Ass. Chief). The sanitation component and Rainwater catchment system is recommended for the Kireme Primary school. Hygiene education activities shall also cover this sub-location.

## **2.9 Sanitation**

### **2.9.1 Household**

In the rural Mtwapa over 50% of the households have no pit latrines. In the coastal area, latrines are built together with the house. Visual inspection in homes away from the coastal line where pit latrines exist, indicated that the pit latrines are poorly constructed, used and maintained.

In view of the aforesaid, it is recommended that the project develops/adopts suitable pit latrine alternatives. The dispersive soils as in Tunzanani and the rocky soils as in Kanamai require appropriate designs.

### **2.9.2 Schools**

Sanitation in schools is grossly inadequate. This makes use and maintenance a cumbersome task. It is recommended that schools be provided with adequate pit latrines. Hygiene education session be conducted in the schools for both teachers and students. It may be useful to provide

two stances per class, one for girls and the other for boys. The class led by the class teacher is then responsible for proper use and maintenance. This approach has yielded good results in schools at the Gelegele - Integrated water and sanitation project.

Emptying of pit latrines will enhance the utility of the investment. It is imperative that emptying arrangements (like in the twin pit) be provided in schools. Standby pit latrines may need to be provided so that as one is in use the other is decomposing before it can be emptied.

## **2.10 Institution building**

The social economic structure here is highly individualistic. However, the religious teachings here cause a high degree of benevolence.

Apparently, this is why individual wells are used communally, and may appear communal at first glance. The communities other than in Kidutani sub location have not mobilised themselves to solve their water problems.

The introduction of new technologies (piped scheme) eroded significantly the prestige hand dug wells enjoyed previously. Shortcomings of the piped schemes seem to be restoring confidence in the wells. The greatest handicap for the wells is the level of salinity the well water compared to piped water.

Careful consideration and enormous amount of public awareness is needed so as to have the two sources existing simultaneously and supplementing each other. Otherwise a seesaw effect will be introduced.

## **2.11 Activities by other organisations**

Other development in water development do not cover Mtwapa location, and thus no duplication of efforts will occur.

## **2.12 Rainfall**

Mtwapa location receives an average annual rainfall ranging from 700 to 1700 mm. Records from the Mtwapa Agro-Met station are shown in Annex 4 for the years Jan 1969 to July 1992. This amount of rainfall is sufficient to sustain rainwater catchment systems.



## 2.13 Health Situation

**Table 1. Number of Patients attending Vipingo RDH Centre and Mtwapa Dispensary Jan-June 1992**

### Vipingo RDHC

	Jan	Feb	Mar	Apr	May	June
Malaria	1319	1340	1291	1346	1584	1706
Urinal tract infection (UTI)	630	149	224	359	173	402
Intestinal worms	212	96	166	85	136	187
Eye	37	31	39	107	40	42
Upper Respiratory tract Infection (URTI)	342	754	751	733	777	908
Skin	27	178	131	277	211	549
Diarrhoea	24	49	42	37	51	82
Schistosomiasis	93	73	6	29	6	44

### Mtwapa Dispensary

	Jan	Feb	Mar	Apr	May	June
Malaria	362	310	380	268	197	262
UTI	41	47	24	15	18	22
Worms	48	61	26	29	81	101
Eye	8	33	10	6	70	8
URTI	641	343	464	380	224	
Skin	26	144	48	16	42	84
Diarrhoea	23	63	71	41	76	85
Schistosomiasis	3	-	2	2	3	2

From Table 1 above it can be concluded that water and sanitation related diseases are prevalent in the area i.e diarrhoea, intestinal worms, eye problems, skin diseases and schistosomiasis. These diseases as recorded in the Vipingo RHDC and Mtwapa dispensary represent 17% of the out patient department diagnosis. Malaria is also a major ailment. The Vipingo Rural Health Centre serves as a focal point for the Kenya Red Cross Society health services in Mtwapa location. This is the centre where KRCS stores supplies and sterilises equipment. Vipingo RDHC is a referral Centre.

The small laboratory at Vipingo needs to be equipped with a powerful microscope to enable the Centre carry out MPS and sputum analysis. The average malaria cases of 1431 per month first six months of 1992 and 710 cases of upper respiratory tract infection (which may include Tuberculosis). The enhance proper diagnosis and thus will greatly enhance an efficient use of drugs and reduce the current practice of treating all suspected cases of malaria which malarial drugs which may lead to an increase of chloroquine resistance traits of malaria.

Diarrhoeal cases, both at the Vipingo HC and Mtwapa dispensary indicate that drinking water quality is poor, while skin, eye diseases show that inadequate water is used for personal hygiene.

Schistosomiasis as recorded in the tables might give an incorrect impression as both health facilities did not have drugs for schistosomiasis and thus a very few recorded cases.

Hygiene Education is an integral part of the Mtwapa water improvement project. It is assumed that 10 health workers shall receive training from each of the 7 sub locations. Hygiene education materials will need to be developed or adopted. Sessions on hygienic practices will need to be provided in the primary and secondary schools. The village health workers will be selected and responsible to the community. Each community will decide appropriate compensation for their health worker.

Also, by careful clinical check-up for school children for water related ailments may help link more clearly the water-disease links. This approach yields results that provide a useful tool to persuade parents/teachers provide the needed improvements. A short term intervention shall be treatment, while the long term solution is preventative interventions such as environmental sanitation.

## 2.14 Educational Establishments

Below is a list of Primary and Secondary Schools in Mtwapa location

1. Mtepeni Primary School - Kidutani Sub location
2. Tunzanani " " - " "
3. Mtwapa " " - Mtwapa "
4. Mtomondoni " " - Shimo la Tewa sub location
5. Barani " " - Mwendo wa Panya sub location
6. Kireme Primary School - Mawamba sub location
7. Kikambala Primary School - Jeuri sub location
8. Msumarini Sec. School - Jeuri sub location

Kanamai sub location was said to have neither a primary nor a secondary school.

## 2.15 Water Quality

Table 3 - WHO Drinking water Quality Guidelines

Parameter	Limit		
	Mtwapa *	Health	Aesthetic
Fluoride	**	1.5mg/l	
Hardness as CaCO <sub>3</sub>	392	-	500 mg/l
Iron	0.55	-	0.3 mg/l
Manganese		-	0.1 mg/l
PH	6.0-7.8	-	6.5-8.5
Total dissolved solids	900	-	1000 mg/l
Colour		-	15 TCU
Turbidity		-	5 NTU
Faecal Coliforms	**	0/100 ml	
Coliform organisms	**	10/100 ml	

\* Highest value in the samples in Annex 3

\*\* Not analyzed for Iron 0. from pond water (possible pollution)

Salinity is equivalent to total dissolved solids in a sample. From literature it is stated that potable waters in the USA have a conductivity range between 50 to 1500  $\mu$ mhos/cm. High turbidity hinders effective disinfection and may encourage bacterial growth.

Compared to the WHO guidelines the water quality as can be seen from Annex 1 & 2 may be said to be of moderate hardness and salinity. The fluoride content of the Mtwapa Groundwater was said to be of acceptable levels. It was not possible for fluorides to be tested during the survey as no reagents were available at the Government Chemist, Mombasa.

It is not recommended to treat the water by chemical means as this would increase the O&M costs beyond what the communities can sustain.

The bacteriological quality of the water is poor and protection at source is the only feasible option, as chlorination is definitely beyond the capacity of the communities on account of sustainability.

## **3 Recommendations**

### **3.1 Introduction**

In order to synthesise the fields and check how they measure with the felt needs of the community a one day workshop was organised at Kanamai Conference and Holiday centre - Uhuru Kamili Hall on analysis 17/8/92. The workshop lasted from 8 a.m. to 4.30 p.m.

Two participants selected by the communities from each of the sub locations attended. The full list of participants is shown in Annex 5. The following sub-locations were represented Kanamai, Mtwapa, Kidutani, Jeuri, Shimo La Tewa and Mwendu wa Panya. The Kenya Red Cross Society and Local Administration were also represented. Mawamba sub-location did not send any representatives and the sub-location was not informed.

After the brief introduction, Mr Odongo gave a short overview of the KRCS activities in Mtwapa location. He stressed the need for "Partners in Development" (Kushirikiana) approach in the development of water and sanitation activities.

After the introductory remarks by Mr Odongo, Mr Oenga gave an overview of the key findings during the village study (visits to the sub-locations).

The participants then divided into groups per sub location and deliberated on three issues:

- i) Type of water problems and choice of technology
- ii) Duties and Responsibilities of each of the "Partners in Development" with special emphasis on community inputs and
- iii) Validity of the key findings as related to each sub-location was not informed.

Each group presented their deliberations in a plenary. These were synthesised as reported in each of the sub-locations sections below. In general, there was concurrence of the workshop participants on the Key findings on the water, sanitation and health problems. The recommendations as herebelow to re-echo those already given in Section 2 of this report.

### **3.2 Choice of Technology**

The rural Mtwapa community requires technologies that present themselves for village level operation and maintenance for the development of their water and sanitation facilities.

The piped water supplies if to be provided to the rural communities especially the Tunzanani area will require large capital costs. This source is at Baricho over 100km north of Mtwapa. The control of such development will be outside the community, reducing the accountability of the water undertakers to the community. Operation and maintenance costs will be in the form of water tariffs (bills), and organisational structure in the community will not be imperative. Quality of piped water supplies is good chemically but may be contaminated while being transported home.

The Rainwater Catchment system has high initial capital costs but little O&M costs. Private individual schools with suitable collecting surfaces may be encouraged to use rainwater for their drinking purposes. Large storage capacities will be required for communal use. Collecting surfaces need to be free of dirt. The water quality is good for drinking purposes, but may require elaborate water management to ensure that the water available lasts through the dry spell.

Groundwater, in Mtwapa location is extensively used. The quality may be slightly Saline, with Total dissolved solids (TDS) below the WHO limit guideline of 1000mg/l. It is recommended that groundwater be utilized for communal water sources while rainwater harvesting is developed in schools. The Lutsanga village who have in the past practised rainwater utilisation (surface runoff) may wish to continue with this option. Suitable capacity tank with paved area surface runoff may be a suitable alternative in the Lutsanga village.

The economic and organisational level of Mtwapa community calls for a stepwise development. First, communal wells will need to be developed without elaborate water drawing devices such as handpumps, windpumps etc. Simple windlass may be provided. The organisation structure suitable for the Mtwapa Community will need to be developed/strengthened at the same time. There is adequate wind power in Mtwapa area to run the windpumps.

Acceptance of responsibility and levels of O&M of the improved communal wells will need to be monitored. And as the community get to understand their obligations and responsibilities further improvements can be done on the wells.

The second step is to introduce windpumps/handpumps whenever appropriate as soon as the community expresses willingness and ability to use such a device. This will need to be done on a case by case basis. Where handpumps/windpumps are provided local artisans need to be trained. Windpumps shall always have storage facilities provided. The issue of spareparts shall need to be ensured on the on-set. Based on this 'demand-driven' approach handing over shall be negative. The KRCS and the community will be partners in development.

Hygiene Education shall be provided through all the project cycle. First as an entry point progressively to instill sense of ownership and proper use of the development facilities as the sense of ownership is the cornerstone to sustainability. Proper use is the only way to ensure that benefits are derived from the developed facility.

The recommendations that follow per sub-location in cooperate both the short term and the long term developments. The short term being provision of wells without one wind pumps. And as the community is able, windpumps handpumps are provided.

### **3.3 Summary of Recommendations**

Below is a summary of recommendations as synthesized in the Analysis Workshop.

#### **3.3.1 Kidutani Sub location**

In Kidutani sub location, the recommended priorities included

- Repair of the Miembekumi Windpump, the storage tanks, bathrooms and wash slabs.
- A shallow well and/or rainwater catchment system (pond) to serve the Lutsanga community.
- Rainwater catchment systems at Mtepeni and Tunzanani Primary School.
- A well near Mtepeni Primary School.
- Improvement of pit latrines in Mtepeni and Tunzanani Primary School.

#### **3.3.2 Mtwapa sub location**

In Mtwapa sub location, it is recommended that one well be identified and be improved. This well should be preferably in an area not currently served by piped scheme. The Barani Mosque well would be ideal. At the Mtwapa Primary School a rainwater catchment system and improvement of pit latrines is recommended.

### **3.3.3 Shimo la tewa sub location**

In Shimo La Tewa a new well is recommended at Mzambarauni, to be dug, equipped with a windpump and a storage tank. The repair of the well at Mr Juba Bakari's plot is also recommended.

The Mtomondoni Primary School needs a rainwater catchment system and the improvement of pit latrines.

### **3.3.4 Kanamai sub location**

In Kanamai sub location, the community is emphatic on the improvement of the Majengo well. It requires a windpump and a storage tank. No school exists in this sub location.

### **3.3.5 Mwendo wa Panya Sub location**

The Mwendo wa Panya community requires a new well on the Late Chief's (The late Harrison Chipa) shamba. The repair and improvement of the Barani Primary School well is also desirable. Either option is recommended. And on a later date the other option be implemented.

The Barani primary school could have rainwater tanks whose overflows could be emptied into the well for groundwater recharge. Pit latrines are recommended.

### **3.3.6 Jeuri Sub location**

In Jeuri sub location both wells i.e. Kisima cha Nyati and Msumarini are recommended. Both wells are within a piped scheme area and will be used as alternative sources only improvement is envisaged at this stage, windpump will not serve useful purpose at this stage.

The Kikambala Primary and Msumarini Secondary School will each require rainwater harvesting and improvement of pit latrine is recommended.

## **3.4 Implementation Strategy**

### **3.4.1 Community Inputs**

The workshop participants recommended the project be community based. The community will be expected to undertake the following activities:-

- Form Water Committee or provide suitable organisational structure
- Select the site of a well or the well to be improved in cases of existing wells.
- Contribute in cash, materials, labour and above all contribute/participate in the planning and design stages by giving ideas and concrete suggestions.
- The developments shall be for and by the community. KRCS shall only be a partner in the development process. Handing over will therefore be unnecessary.
- O&M will be the responsibility of the community.

The workshop participants recognised the fact that community management should encompass three main areas:

- Vitendo i.e. Action (labour)
- Mawazo i.e. Decision making (planning/design)
- Mali i.e. Contribution in cash, materials

In order to enhance community management, honesty and trustworthiness were identified as pillars of sustainability. In the digging of pit latrines in schools the community shall do the digging and the project to provide technical and material inputs only. No digging should be done by the project.

#### **3.4.2 Capacity building for O&M**

The project shall ensure the availability of spare parts for the handpumps/windpumps that shall be installed. The distribution of the spareparts, their costs need to be understood, so as to advise the consumers before hand what the O&M cost implications are before choosing any given technology.

Training of local artisans to undertake repair work will enhance reliability as well as sustainability. Ownership of the developed water facilities will be communal. The community may therefore wish to outpoint a "caretaker committee" or institute such organisational measures that will ensure proper use and maintenance.

#### **3.4.3 Staff/Equipment**

The KRCS may wish to employ a qualified water technician for this project. It may be necessary to do the project by local contracts to reduce on the number of directly employed staff and required equipment e.g. groundwater siting equipment. A suitable vehicle 4WD may need to be made available. The items indicated on this section have not been costed in the budget.

## 4 Budget

Below are budget estimates, for the recommended water, sanitation and hygiene activities in Mtwapa location.

Description	Cost in KSh.
<u>Kidutani</u>	
1 Repair: Miembekumi @ 300,000/-	300,000.00
1 Lutsanga well/pond @ 300,000/- (equipped with windpump)	300,000.00
1 Well near Mtepeni Primary	300,000.00
<i>Rainwater catchment system</i>	
Tunzanani tanks 4x10m <sup>3</sup> @ 20,000/-	80,000.00
Mtepeni tanks 4x10m <sup>3</sup> @ 20,000/-	80,000.00
<i>Pit latrines</i>	
Tunzanani 15 stances @ 7,500	112,500.00
Mtepeni 30 stances @ 7,500	225,000.00
<u>Mtwapa</u>	
1 Well @ 200,000 (windpump only)	200,000.00
Rainwater Tanks 4x10m <sup>3</sup> @ 20000	80,000.00
Pit latrines 15 stances @ 7,500/-	112,500.00
<u>Shimo la Tewa</u>	
1 Well @ 300,000/- at Mzambarauni	300,000.00
Rainwater tanks 4x10m <sup>3</sup> @ 20,000/-	50,000.00
Pit latrines 10 stances @ 7,500/-	80,000.00
	75,000.00
<u>Kanamai</u>	
	200,000.00
Improve 1 well - Majengo well	
<u>Mwendo wa Panya</u>	
	300,000.00
New well @ 300,000	200,000.00
Improve Barani well	40,000.00
Rainwater tanks 2x10m <sup>3</sup> @ 20,000	150,000.00
Pit latrines 20 stances @ 7,500	



Description	Cost in KSh.
<u>Jeuri</u>	
2 Wells improvement @ 100,000	200,000.00
<i>Rainwater tanks</i>	
Msumarini 5x10m <sup>3</sup> @ 20,000	100,000.00
Kikambala 4x10m <sup>3</sup> @ 20,000	80,000.00
<i>Pit latrines</i>	
Msumarini 10 stances @ 7,500	75,000.00
Kikambala 12 stances @ 7,500	90,000.00
<u>Hygiene Education Mawamba</u>	75,000.00
Kireme pit latrines 10 @ 7500	80,000.00
Rainwater 4x10m <sup>3</sup> @ 20,000	210,000.00
Trainees 70 @ 3,000	200,000.00
Materials (lumpsum)	200,000.00
Hygiene in Schools (lumpsum)	
<u>Household Sanitation</u>	NIL
Tótal	4,382,500.00
Contingency 15%	657,375.00
<b>GRAND TOTAL</b>	<b>5,039,875.00</b>
Assume US\$ = Ksh 30	US \$ 168,000.00

Comment: No supervisory/technical personnel emoluments, allowances and logistical support has been included in the budget.

**Annexes**

## Annex 1 Chemical Analysis of Well water samples - Mtwapa Location

WRAP Preliminary draft findings

Well No.	Locality	PH	Iron	Total Hardness	Total Alkalinity	Salinity	TDS
1	Chief's office	8.0	0.15	476	396	517	1477
3	Near Chief's office	8.0	0.5	470	398	325	1015
4	Mtomondoni	7.9	0.15	470	342	320	1108
7	Mtomondoni	8.2	0.35				
8	Mtondoni	7.4	0.5	528	504	248	1200
9	Mtondoni	6.9	0.25	66	36	168	471
10	Mtondoni	7.6	0.3	426	390	385	1200
14	Mtondoni	7.7	0.64	290	412	479	1385
16	Mtondoni	7.5	2.6	584	455	1257	2400
18	Mtondoni	7.4	0.4	710	382	492	1292
20	Mtondoni	8.5	0.28	972	178	1889	3323
22	Mtondoni	8.2	0.32	378	382	385	1292
25	Near Mtwapa Research	7.5	0.22	354	326	188	766
28		7.6	0.68	362	364	94	646
38	Mtepeni	8.5	0.24	326	384	147	701
42	Miongotini-Mtepeni	7.6	0.18	388	386	106	6692
43	Bomani	7.4	0.22	192	206	193	609
44	Bomani	7.0	0.08	296	158	439	1015
50	Mtepeni	7.5	0.32	316	356	71	591
51	Bomani Kireme	7.4	0.22	192	206	193	609

Well No.	Locality	PH	Iron	Total Hardness	Total Alkalinity	Salinity	TDS
55	Maamba-Bomani	7.8	0.28	288	322	106	600
57	Maamba-Bomoni	7.8	0.28	276	288	178	665
59		7.6	0.36	426	412	262	1015
63	Maamba	7.5	0.40	210	202	248	692
64	Bomani Centre	7.4	0.16	212	132	261	655
65	Bomani Centre	7.5	0.16	192	26	53	572
68	Mwatundo	6.8	0.25	192	116	302	646
72	Mzambarauni	7.8	0.3	522	352	259	1015
78	Mzambarauni	8.0	0.35	284	338	226	923
79	Mzambarauni	7.4	0.25	314	484	107	748
80	Mzambarauni	7.5	0.4	356	268	102	554
81	Mzambarauni	7.0	0.26	336	464	101	794
84	Country Farm	7.1	0.25	532	408	157	809
85	Ndonga	7.4	0.25	408	372	294	1015
87	Mzambarauni	7.0	0.3	194	432	116	773
89	Ndonga	7.2	0.3	422	362	137	742
92	Ndonga	8.0	0.35	294	356	183	923
94	Mtepeni	7.6	0.35	240	258	107	563
96	Azhar Mosque-Majengo Centre	7.2	0.25	598	358	132	1015
99	Mtwapa (Majengo)	7.0	0.25	175	408	111	747

Well No.	Locality	PH	Iron	Total Hardness	Total Alkalinity	Salinity	TDS
105	Kikambala-Gorofani	6.9	0.2	304	358	241	923
106	Kikambata-Gorofani	7.5	0.17	368	402	307	766
108	Kikambala-Gorofani	7.5	0.17	286	392	231	600
110	Kikambala-Gorofani	7.3	0.19	202	420	269	628
112	Kikambala-Gorofani	8.2	0.16	424	572	441	1015
115	Mtepeni	8.0	0.17	164	500	101	397
117	Mtepeni	8.1	0.17	182	500	140	480
124	Mtwapa-Bridge	7.7	0.2	336	368	55	388
127	Mzambarauni	7.8	2.2	222	348	78	342
129	Kikambala	8.2	0.25	236	298	92	498
130	Kikambala	8.0	0.25	354	390	271	692
135	Kikambala	7.8	0.23	386	434	444	1108
137	Kikambala	7.9	0.2	318	412	223	5528
139	Maamba (Bomani)	7.2	0.2	336	380	234	664
140	Maamba-Kikambala	7.3	0.2	304	348	380	1115

Source: WRAP Preliminary draft findings

## Annex 2 Revised and Initial Tentative Programmes

### Field Revised Programme

6/8/92 Preparation for field trip

9/8/92 Travel to Mtwapa

10/8/92 8.00 a.m. Visit Government Chemist laboratories, Mombasa

9.40 a.m. Mtwapa Chief's office

Met Mr Mwanyae Donald - Chief Mtwapa

Mr Rodgers Mwalimu Tungu - Asst. Chief

Kanamai and Mwendo wa Panya sub-locations Mr Simon Arlington Jefwa  
Ngome Asst. Chief -Kidutani, Mawamba and Jeuri sub-locations.

The Assistant Chief for Mtwapa and Shimo la Tewa sub-locations Mr  
Mohamed Hamis Abdalla was on leave. Mr Johnson Chigogo Mwangala -  
KRCS.

11.30 to 3.00 DWE's office Kilifi, had meetings with:-  
Mr P K Gicheru - DWE, Kilifi

Mr Mwangi - Project Manager

Mr Kituri - Geologist - WRAP

***Discussions with DWE on:***

• ***Water development activities in Kilifi district, as they relate to Mtwapa location in particular***

• ***Water Resources Assessment Project (WRAP) - Kilifi***

• ***Kilifi Water and Sanitation Project (KIWASAP)***

Programme was reviewed in light of planned locational activities.

11/8/92 Tuesday Visit Kidutani sub-location

12/8/92 Wedn. Visit Mtwapa and Shimo la Tewa sub-locations. (Asst. Chief to be informed to arrange meetings)

13/8/92 Thursday Visit Kanamai, Mwendo wa Panya, Jeuri and Mawamba sub-locations

14/8/92 Friday Kilifi DWE's office

15/8/92 Saturday Free

16/8/92 Sunday Report writing, analysis

17/8/92 Monday Analysis workshop, Kanamai Conference Centre

## Initial Work Programme

6/8/92	Thursday	Prepare field survey tools, contact government chemist
7/8/92	Friday	No activity
8/8/92	Saturday	No activity
9/8/92	Sunday	Travel to Mombasa, by road
10/9/92	Monday	Contact Government chemist, Mombasa Meet the KRCS representative in Mtwapa, chief Mtwapa Meet DWE Kilifi, Discuss WRAP, GTZ, DWE Plans as related to Mtwapa
11/8/92	Tuesday	Visit Kidutani (Mtepeni) Sub-location, 9:00 a.m. Select (2) water sources. Take water samples and deliver to Government chemist Mombasa. Meet villagers fro the two water sources - 11:00 a.m. (Possibly in one meeting). Group discussion (women) 2 p.m. KRCS to organize the meetings.
12/8/92	Wednesday	Visit Mtwapa sub-location - 9:00 a.m. See (2) water sources. Take and deliver water samples to Mombasa. Meet villagers from the two water sources - 11:00 a.m. (possibly in one meeting). KRCS to organize the meetings. Group discussion (women) 2:00 p.m.
13/8/92	Thursday	Visit three (3) other sub-locations. Discuss with village elders Take and deliver water samples from one source from each of the sub-locations. (The KRCS to plan a suitable route and organize that a group of elders men/women are available in each village. KRCS to specify time of meetings in each of the villages to be visited).
14/8/92	Friday	Visit two (2) last sub-locations Discuss with village elders Take and deliver water to Mombasa from one source in each of the sub-locations. (KRCS to do logistics as for Thursday)
15/8/92	Saturday	Free
16/8/92	Sunday	Analysis, outline report writing
17/8/92	Monday	Review workshop of findings with KRCS staff and selected elders two from each of the sub-locations (1 man, 1 woman). Mr. A. Odongo to attend. KRCS to organize (assist in selection of participants, travel, meals)
18/8/92	Tuesday	Report writing, discuss draft with Mr. Amos Odongo in Mtwapa
19/8/92	Wednesday	Travel to Nairobi
20/8/92	Thursday	Report writing
21/8/92	Friday	Finalize report writing
28/8/92	Friday	Despatch report to IRC for comments (Hard copy and another on WP 5.1 in a 3.5 diskette)
13/9/92	Sunday	Jo Smet/KRCS/Oenga In September, Mr. Jo Smet could have an input on his way from HESAWA Evaluation.

**Annex 3 Report on Chemical Analysis of Water**



GOVERNMENT CHEMIST'S DEPARTMENT, MOMBASA, P.O. BOX 81119, MSA.  
 REPORT ON CHEMICAL ANALYSIS OF WATER

SENDER: ISAACK OENGA  
 AMREF  
 P O BOX 30125  
 NAIROBI


Sample No. and Source	Parameters				
	TDS (salinity)	Hardness(Total)	Iron	pH	Fluoride
114 ABU ZAIDAN well	570 ppm	284 ppm	Not detected	6.6	-
115 HAMIST ATHUMAN well	900 ppm	392 ppm	Not detected	6.5	-
116 MTOMONDONI well	700 ppm	360 ppm	Not detected	7.8	-
118 KISIMA NYATI well	700 ppm	304 ppm	Not detected	7.3	-
119 MAJENGO well	560 ppm	328 ppm	Not detected	6.0	-
120 BARANI PRY. SCHOOL well	900 ppm	336 ppm	Not detected	6.2	-

REPORT:

The above water from various sources in Mtwapa can be described as hard and of acceptable salinity. /be

Majengo and Barani Primar Schools, wells require lime treatment to increase their pH's.

Generally, borehole/well waters of Mtwapa have been found not to have fluoride content greater than 1.5 ppm.

  
 S. M. Mwangi  
 Govt. Analyst.



REPUBLIC OF KENYA  
 OFFICE OF THE PRESIDENT  
 GOVERNMENT CHEMIST'S DEPARTMENT—MOMBASA  
 REPORT ON CHEMICAL ANALYSIS OF WATER

Telephone 471931/471923  
 P.O. Box 81119  
 MOMBASA, KENYA

Date: 17th August, 1992

Report Reference: WQ.1/VOLXV111/112/92/21

Laboratory Sample No.: 112                      Date Received: 11.8.92                      Date Sample Taken:

Sender: Mr. Isaack Oenga AMREF, P.O. Box 30125, Nairobi.

Source: River

RESULTS

Colour -    5 Hazen Units                      Turbidity: Clear

Deposit None

Taste -    Odour Unobjectionable

pH 6.6    Electrical Conductivity at 25° C. 1100  
 (micro mhos/cm<sup>3</sup>)

	Parts per million (milligrams per litre)
Free Carbon Dioxide .. .. .	16
Free and Saline Ammonia as Nitrogen (N) .. .. .	0.005
Albuminoid Ammonia as Nitrogen (N) .. .. .	0.132
Nitrates as Nitrogen (N) .. .. .	-
Nitrites as Nitrogen (N) .. .. .	0.002
Oxygen absorbed. Four hours at 27° C. (O) .. .. .	1.7
Alkalinity as CaCO <sub>3</sub> — Phenolphthalein (Carbonate) .. .. .	Nil
Methyl Orange (Bicarbonate) .. .. .	316
Carbonate Hardness as Calcium Carbonate (CaCO <sub>3</sub> ) .. .. .	316
Non-Carbonate Hardness as Calcium Carbonate (CaCO <sub>3</sub> ) .. .. .	368
Chloride (Cl) .. .. .	404
Sulphate (SO <sub>4</sub> ) .. .. .	250
Silica (SiO <sub>2</sub> ) .. .. .	10
Fluoride (F) .. .. .	-
Potassium (K) .. .. .	-
Sodium (Na) .. .. .	-
Calcium (Ca) .. .. .	129.6
Magnesium (Mg) .. .. .	87.4
Manganese (Mn) .. .. .	Not detected
Iron (Fe) .. .. .	Not detected
Lead (Pb) .. .. .	-
Copper (Cu) .. .. .	Not detected
Zinc (Zn) .. .. .	0.1
Total Dissolved Solids, residue dried at 180° C. .. .. .	800

REMARKS: A very hard water of fair mineral composition.  
 It is indicative of organic contamination.  
 Bacteriological examination is necessary before  
 the water can be put into domestic use.

*J.K. Njenga*  
 ( J.K. NJENGA )  
 Government Chemist Analyst.

REPUBLIC OF KENYA  
OFFICE OF THE PRESIDENT  
GOVERNMENT CHEMIST'S DEPARTMENT—MOMBASA  
REPORT ON CHEMICAL ANALYSIS OF WATER

Telephone 471931/471923  
P.O. Box 81119  
MOMBASA, KENYA

Report Reference: WQ.1/VOL. XV111/110/92/19

Date: 17th August, 1992

Laboratory Sample No. 110

Date Received: 11.8.92

Date Sample Taken:

Sender: Isaac Oenga AMREF, Box 30125, Nairobi.

Source: Pond

RESULTS

Colour —

500 Hazen Units

Turbidity:

Deposit

Taste


Odour

pH 7.2

Electrical Conductivity at 25° C. 180  
(micro mhos/cm<sup>3</sup>)

	<i>Parts per million (milligrams per litre)</i>
Free Carbon Dioxide .. .. .	40
Free and Saline Ammonia as Nitrogen (N) .. .. .	0.017
Albuminoid Ammonia as Nitrogen (N) .. .. .	0.234
Nitrates as Nitrogen (N) .. .. .	—
Nitrites as Nitrogen (N) .. .. .	0.02
Oxygen absorbed. Four hours at 27° C. (O) .. .. .	4.5
Alkalinity as CaCO <sub>3</sub> — Phenolphthalein (Carbonate) .. .. .	Nil
Methyl Orange (Bicarbonate) .. .. .	120
Carbonate Hardness as Calcium Carbonate (CaCO <sub>3</sub> ) .. .. .	100
Non-Carbonate Hardness as Calcium Carbonate (CaCO <sub>3</sub> ) .. .. .	Nil
Chloride (Cl) .. .. .	36
Sulphate (SO <sub>4</sub> ) .. .. .	5
Silica (SiO <sub>2</sub> ) .. .. .	60
Fluoride (F) .. .. .	—
Potassium (K) .. .. .	—
Sodium (Na) .. .. .	—
Calcium (Ca) .. .. .	32
Magnesium (Mg) .. .. .	9.2
Manganese (Mn) .. .. .	Not detected
Iron (Fe) .. .. .	0.55
Lead (Pb) .. .. .	—
Copper (Cu) .. .. .	Not detected
Zinc (Zn) .. .. .	0.01
Total Dissolved Solids, residue dried at 180° C. .. .. .	130

REMARKS: A moderately hard water of high colour. It is indicative of organic contamination. Bacteriological examination is necessary before the water can be put into domestic use.

  
( J.K. NJENGA )  
Government Chemist Analyst.

**Annex 4 Rainfall Data- Mtwapa Agro-met station**

## ANNEX 4

**MTWAPA AGRO-MET STATION****TOTAL MONTHLY AND ANNUAL RAINFALL FROM 1969 TO 1992 IN MM**

YEAR	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	TOTALS
1992	0.3	0.4	11.7	137.6	408.4	106.5	153.2						
1991	19.7	8.7	55.7	12.1	363.2	129.4	245.2	78.1	25.2	19.2	28.1	11.4	1177.5
1990	33.8	18.7	151.8	219.0	126.9	127.3	47.6	64.3	67.8	168.7	57.3	65.2	1149.0
1989	39.2	11.2	52.1	270.3	279.9	109.1	101.4	51.9	65.7	143.4	51.1	131.6	1255.9
1988	33.2	10.7	94.0	449.1	98.4	292.7	38.2	75.3	58.1	31.2	140.1	26.5	1417.5
1987	16.9	3.3	19.2	192.1	308.5	22.7	85.6	259.1	56.2	35.8	25.0	37.7	1062.1
1986	45.0	1.0	103.8	346.5	670.7	58.1	14.4	52.8	27.0	69.6	116.9	133.9	1646.9
1985	20.3	50.6	48.3	209.9	277.5	54.0	146.8	91.3	38.3	43.8	51.7	69.3	1101.2
1984	0.2	NIL	26.3	297.8	3215	169.6	119.3	18.6	90.9	299.4	163.5	28.1	1533.2
1983	1.4	5.0	67.4	163.9	563.4	223.3	163.1	22.9	64.2	32.2	19.6	10.6	1347.2
1982	1.4	NIL	38.2	281.3	660.4	118.2	219.4	72.5	110.1	196.7	57.6	28.0	1763.6
1981	21.3	0.2	170.2	107.1	161.4	90.2	51.6	74.6	39.2	132.8	144.8	90.0	1083.3
1980	2.3	8.8	25.5	308.0	93.6	561	100.0	271.2	22.0	20.7	42.6	26.4	976.6
1979	13.0	37.2	140.1	162.3	578.3	65.2	77.1	73.1	122.7	26.5	59.4	126.1	1497.9
1978	41.0	48.5	64.6	237.8	350.7	155.3	106.5	66.7	22.6	55.2	172.0	157.1	1478.0
1977	NIL	NIL	59.8	166.8	73.4	112.5	60.9	118.4	126.1	298.7	150.6	125.5	1292.4
1976	7.3	1.9	13.9	158.5	156.1	186.9	124.1	25.7	152.7	33.5	25.0	62.6	948.2

1975	24.1	NIL	32.4	237.9	224.8	193.7	102.5	138 <sup>15.8?</sup>	70.2	29.8	15.6	75.1	119.1 <sup>1144.1 or 1019.9</sup>
1974	9.8	4.6	29.4	132.5	115.5	148.8	106.1	21.2	50.7	8.2	39.7	16.9	1682.4
1973	1.1	5.6	2.0	399.1	382.2	185.9	24.4	105.0	25.3	25.6	92.6	339	1273.6
1972	438	16.5	19.0	64.5	573.4	32.2	105.9	85.5	163.0	299.0	104.0	9.1	1439.2
1971	2.5	NIL	49.6	165.7	230.8	262.6	124.6	36.4	33.3	5.2	7.0	107.1	1057.9
1970	7.5	NIL	31.0	195.5	275.2	56.0	62.5	35.2	35.2	14.7	15.5	43.3	758.4
1969	11.0	47.5	29.5	53.5	170.2	171.2	119.0	124.0	31.5	105.6	139.2	8.0	1011.6

## Annex 5 Analysis Workshop: List of Participants

Majengo Mtwapa	<p>Mwinyi Mohammed Mwinyi Badi P O Box 56 Kikambala</p> <p>Omari Hyder Mbogo Konde Majengo Mtwapa P O Box 47 Kikambala</p>	Shimo La Tewa Sub-Location	<p>Dorothy Kanini Mwatsuma P O Box 178 Kikambala</p> <p>Bahati Esmail P O Box 178 Kikambala Mtwapa Location</p>
Mtwapa Sub-Location	<p>TOT: Omar Salim Stajabuni P O Box 133 Kikambala</p> <p>Asst. TOT: Esther Kitunga Baya PO Box 28 Kikambala</p>	Mwendo wa Panya Location	<p>Emily Chipa P O Box 33 Kikambala</p> <p>Shabani Mbawa P O Box 47 Kikambala</p> <p>Rukia Khamisi P O Box 47 Kikambala</p>
Kidutani Sub-Location	<p>Moses Pekeshe Chigogo c/o Mtepeni Primary School P O Box 292 Kikambala</p> <p>William Mwamba c/o Mtepeni Primary School P O Box 29 Kikambala</p> <p>Samson John Mwavita c/o Mtepeni Primary School P O Box 29 Kikambala</p>	Kenya Red Cross Society	<p>Mr Amos Odongo KRCS Box 40712 Tel: 503781/9 Telex: 503845 Nairobi</p> <p>Mr Johnson Chigogo Mwangala KRCS, Field officer</p>
Jeuri Sub-location	<p>Bwana James Kahindi Kazungu P O Box 258 Kikambala</p> <p>Sammy Barisika Msumarini P O Box 83 Vipingo</p>	Local Administration	<p>Mr Rodgers Mwalimu Tungu c/o Chief's Office Mtwapa Location Box 44 Kikambala</p>
		NETWAS - AMREF	<p>Mr Isaack Oenga P.O. Box 30125 Nairobi</p>



## **Annex 6: Analysis Workshop Programme**

8.00 a.m.	Arrival of Participants
8.00 - 8.30 a.m	Registration, Introduction
8.30 - 9 a.m.	Introductory Remarks - Mr Amos Odongo
9 - 10.00	An overview of the key Findings - I O Oenga
10.30 a.m.-1.0 p.m.	Group discussions
1.0 - 2.0 p.m.	Lunch
2 p.m. - 4.00 p.m.	Plenary facilitated by I O Oenga
4.0 - 4.30 p.m.	Concluding remarks Mr Rodgers Mwalimu Tungu
4.30 - 5 p.m.	Tea and Departure

**Annex 7 Initial Kilifi Water Project Proposal**

KENYA RED CROSS SOCIETY

CBHC/PHC PROJECT

COMMUNITY DIAGNOSIS/BASE LINE

SURVEY REPORT

MTWAPA LOCATION - KILIFI DISTRICT

10TH - 19TH OCTOBER 1989.

FLORENCE B.N. MATETE

CBHC/PHC FIELD OFFICER - KILIFI

(i) Water Supply:

Response	Respondents	Percentage	Total Homesteads
Tap	98	81.6%	120
Protected Well	2	1.6%	120
Unprotected Well	7	5.8%	120
Protected Spring	-	-	120
Unprotected Spring	3	2.5%	120
River	13	10.8%	120
Dam	1	0.8%	120
Roof Catchment	12	10 %	120

Conclusion:

The above figures on the table show that 81.6% use tapped water while 1.6% use water from protected sources. The rest use unprotected water from dams, rivers, wells, springs and roof catchment.

(j) Water Treatment:

Response	Respondents	Percentage	Total Homesteads
People who treat water	40	33.3%	120
People who don't treat water	80	66.6%	120

(k) Method of Treatment:

Response	Respondents	Percentage	Total Homesteads
Boiling	40	33.3%	120
Three pot system	-	-	120
Others	2	1.6%	120
No method at all	78	65 %	120

**Conclusion:**

The above tables show that majority do not treat their water; only 33.3% use boiling method and 1.6% use other methods. The Community need to be educated on methods of treating water.

**8. EDUCATIONAL FACILITIES:**

The table shows respondents awareness of the educational facilities in their area.

Response	Respondents	Percentage	No. of Homesteads
Nursery Schools	110	91.6%	120
Primary Schools	111	92.5%	120
Secondary	73	60.8%	120
Adult Literacy	59	49 %	120
Village Polytechnics	13	10.5%	120
Others	8	6.6%	120

**Conclusion:**

Out of the one hundred and twenty homesteads visited 91.6% were aware of the nursery schools, 92.5% of the primary schools, 60% aware of the one secondary school in the catchment area and have children who go to Msumarini Secondary School everyday by matatus, bicycles and on foot.

The rest of the percentage responded to adult literacy classes, village polytechnics and others.

**9. HEALTH FACILITIES**

The table below shows the Community awareness of the health facilities around them.

CBHC - Mtwapa location

=====

The feasibility study, executed from 7 - 26 November 1988 by A. Korver, covered the whole Kilifi district. In October 1989 Florence Mutete, the field coordinator of the Mtwapa location implemented a baseline survey (a modified A. Korver version) in the location.

The main conclusion and some comments of this survey are:

- 1) The population distribution in this survey is not typical for the Kilifi district, i.e. Mtwapa: 16% belong to the age of 0 - 5 years (Kilifi: 25%) and about 13% has the age of 6 - 15 years (Kilifi: 25%). In the sample female population is higher than the male population.
- 2) The percentage off full immunized children (0 - 5 years) is 58%; 12% is not immunized and 30% partly immunized. (The national planning was an immunization coverage of 65% in 1990).
- 3) Growth monitoring shows that 58% of the children have an upward growth trend. However, 39% of the mothers could not present a growth card. The children with a downward growth trend should be followed by the CHW. Education of mothers about the use of growth cards must be strengthened.
- 4) Also mothers knowledge on immunization was observed. 73% of the interviewed mothers, present an awareness about the necessity of immunization in necessary for prevention of diseases while 25% did not know.
- 5) Breastfeeding: 46% of the mothers stop breastfeeding at the children age of two, while 41% stop at the age above two years. (These percentages must be related to weaning practices and nutritional status because weaning practices and breastfeeding interfere each other after 3 - 6 months).
- 6) Weaning practices: 55% of the mothers started weaning at the age of three months, while 37% of the mothers said six months. A low percentage of 4% said one month.
- 7) Nutritional habits: the majority of the children eat and live on food they grow, 100% eat ugali with local vegetables. The collected data don't permit conclusions, about the health related items. More nutritional education seems to be important.
- 8) Disease prevalence: The most prevalent disease is malaria, since the Coastal Region is a mosquito infested area. Other diseases are common cold (72,5%) and diarrhoea and vomiting (64% .  
Comments: It's not clear in which period the diseases are prevalent in the questionnaire: 1 month, 1 year?).
- 9) Environmental sanitation: 70,8% have pit latrines; 17,5% yet use the bush while 6,6% go to their gardens.

10) Dish racks are present in 54.2% of the households; 71,6% refuse disposal in pit while 28% dispose their refuse in the bush, garden and other methods; 93% have wire lines.

11) Water supply: 81,6% (!) use tapped water while 1,6% use water from protected sources. Only 33,5% of the people treat water, the rest not.

Comments: these data are very important for future planning. The field coordinator told the mission that water is not a major problem. Except in some sublocations, where simple action can be done to improve water supply, no structural activity seems to be indicated in the next few years. Education about water treatment is highly recommended.

12) All respondents are aware of the existence of the Health centre and dispensary, while only 70% know the hospital in Kilifi and only 25% of the coast province General Hospital (nearest to the area). Traditional healers say to the people that there is no hospital. Only 20% of the people get services from the mobile clinic of the MOH.

#### Observations in Mtwapa-location

##### 1) Ministry of Health

The mission had a meeting with the new district officer of MOH, Dr. Baya. Because of his recent entry in the Kilifi district he still was not involved in the project. No reports were presented in the last 2 years to the MOH. A discussion started about the implementation of an immunization campaign in Mtwapa location executed by the KRCS.

The MOH in the Kilifi-district has to face the problem of manpower constraints. Participation of the MOH in the immunization activities therefore is observed very difficult. If the fieldcoordinator present a concrete plan the MOH is willingness to provide some support (vaccines, coldboxes). They invited the KRCS to extend their immunization-activities to sublocations bordered to the program area. The mission requested statistical material about the health situation in the Mtwapa location. This was promised, not received.

##### 2) Health Centre (meeting with Dr. Chula)

The Health Centre in Vipingo cover 3 dispensaries and 5 sublocations by a mobile team. The director of this HC criticised the choice of the Mtwapa location by the KRCS, because this location was in favour regarding to accessibility of health services and health indicators. He observed Mtwapa as semi urban region (near to Mombasa). He suggested that personal motives of some authorities has contributed to this decision.

About 150 patients visit the HC daily. They are served by the clinical officer or nurses. The HC is understaffed: the

KENYA RED CROSS SOCIETY

REPORT ON THE BASELINE SURVEY OF BOREHOLES/WELLS IN MTWAPA LOCATION: 26/4/91

1. Shimo latewa Sub-location - sub chief I/c Mohamed Khamis.

1. **Borehole 1** - owner Bakari chuba.

2. No. of people who use this bore hole.

3. What will be the participation of the community and are they ready? They may be ready once educated.

If we KRCS repair the borehole what will be the priority of the community towards this? The Chairman said the community will be educated and asked what their feeling is towards this project so that they can be able to participate fully since their priority is in water.

According to the owner of this borehole he has let the community to use the water he had planned to repair but in case the Society is ready he has no problem.

- If there is water problem really how comes no one has bothered to repair this borehole?

The Chairman answered and said the community had contributed towards repairing another borehole.

Mr. Amos Odongo advised the members that the community should be involved in the administration should also be involved. There should be a committee to look after the well. The community should say what will be their contribution if in terms of money what amount will they contribute.

- He also said there must be a pump attendant who will know how to deal with it.

- There must be an account to repair what has been broken down.

SUMMARY:

In Shimo latewa Sub-location there are two bore holes to be repaired plus one which will be repaired by the owner.

2. MTWAPA SUB-LOCATION/BARANI

In these Sub-locations there are six bore-holes in total to be repaired



3 KANAMAI SUB-LOCATION:

Sub-chief 1/c Rodgers Tangu.

In this sub-location there are three boreholes to be repaired (barani, kikambala primary schools + majengo centre).

JEURI SUB LOCATION

Sub-chief 1/c Donald Mwanyae (ACTING CHIEF)

- 1) Maamba - One borehole (Kisima cha Nyati, Government land) Mtepeni - 3 boreholes.
- 2) In Mtepeni Mr. William Mwamba has offered an acre in plot No 148 for a borehole to be sunk on behalf of the community.

Mr. Odongo said for a borehole to be sunk research must have been done to see whether there is water in that particular area.

They said there are some certain trees which indicate there is water in that particular area.

3. KIDUTANI - There are no boreholes in this area but there are people who have volunteered to give part of their land for boreholes to be sunk.  
- Sub-chief Tangu gave a suggestion of improving the wells by using windmills instead of hand pumps. Which needs a lot of man power.

4. MSUMARINI - 1/c Donald Mwanjar. There is one borehole to be repaired, next to Secondary school. They felt they should have borehole sunk at Msumarini Primary school.

SUMMARY

Mr. Odongo introduced Ms. Juliana Karisa to the Chief and sub-chiefs. he said she is 1/c of the Kilifi Branch Development. Mr. Mohammed Khamin asked whether each borehole will have a committee.

Mr. Odongo said each borehole should have a committee plus one major water committee in chiefs office.

Each committee should at least have 7 people - Chairman, Secretary, Treasurer and 4 members.

The major water committee will include two members from each borehole to attend

meetings of this committee.

Lastly the chief thanked Mr. Odongo for his tireless efforts he has done to make sure Mtwapa develops as far as PHC is concerned.

**VISITS TO BORE-HOLES:**

**1. Shimo la tewa**

- ✓ Borehole No. 1 - Its abandoned due to breakage of the hand pump.
- ✓ Borehole No. 2 - Not protected, it looks clean and its on use already this belongs to the same person as no one to be added 5ft deeper.

**2. Mtwapa - Borehole No. 3**

The well is abandoned. Walls are cracked down, it needs to be cleaned and repaired thouroughly.

**Borehole No. 4**

The borehole is on use and has a lot of water - walls are not bad but needs some repairing. Approximately 150 people use this borehole.

**Borehole No. 5 (Mtwapa Mtaani).**

The borehole is clean and in use. the condition of the walls is good, approximately 250 people use this water. In Mtwapa location all three wells to be repaired.

**Mtwapa/Barani**

**Borehole No. 6.**

The borehole is in use right now the circumference is quite wide condition of walls is good. approximately 500 people use it.

**Borehole No. 7.**

The borehole is in use already it is in favourable conditions near Barani mosque. It is used by approximately 300 people the walls need some slight repairs.

**KANAMAI SUB-LOCATION**

**Madara Borehole No. 8.**

This borehole is at Barani Primary School. It is supposed to be used by school children. It is in good condition the borehole was built/constructed by Haji Musa in 1975 it is going to be of very good use if it is rehabilitated.

**MTEPENI**

**Borehole No. 9.**

This borehole belongs to Ibrahim Mataza, he constructed the borehole for his own and communitys use. The Borehole is in use already. We therefore propose a windmill for this borehole. The borehole was constructed in 1981. The borehole is 98ft deep. Its used by approximately 200 people.

**Borehole No. 10.**

The borehole was constructed in 1986 at Benjamin Kolongo. It is already being used by approximately over 100 people. Sometimes water gets low that they have to shift to another, sometimes they shift when the borehole is being cleaned.

**Borehole No. 11**

Drilled with windmill fixed but there is slight blockage which makes water not to flow to the resource (tanks) water is available and if onlythe community agrees to mend the small damage water will be available all through. This has been abandoned by the community.

**MAJENGO**

**Borehole No. 12**

The borehole has water but not in use, the condition of the borehole is good, due to lack of co-ordination the borehole is abandoned. The bore will approximately serve over 300 people once repaired. The borehole is on Government land.

**MSUMARINI BOREHOLE NO. 13**

The borehole was abandoned due to women having opened tap water, but the tap water is still a problem so the boreholes willstill help after they are repaired.

No  
Luggye

KIKAMBALA 5 LOCATION

KISIMA CHA NYATI BOREHOLE NO. 14

The borehole is in use with plenty of water, it is a Government borehole, sure it is a Government land. It is approximately 45 feet deep. The condition of the walls is good it needs to be deepened 5 ft down before protection.

SUMMARY

The above are the boreholes surveyed on the 26/4/91 by CHWs, Chief, Field Officer PHT and PHC Co-ordinator.



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**AMOS ODONGO**  
**PHC/CBHC CO-ORDINATOR**