BASIC DESIGN STUDY
ON
THE PROJECT FOR NORTH KAWINGA GROUNDWATER SUPPLY
IN
THE REPUBLIC OF MALAWI

OCTOBER, 1987

JAPAN INTERNATIONAL COOPERATION AGENCY

BASIC DESIGN STUDY
ON
THE PROJECT FOR NORTH KAWINGA GROUNDWATER SUPPLY
IN
THE REPUBLIC OF MALAWI

OCTOBER, 1987

JAPAN INTERNATIONAL COOPERATION AGENCY

PREFACE

In response to the request of the Government of the Republic of Malawi, the Government of Japan has decided to conduct a basic design study on the Project for North Kawinga Groundwater Supply and entrusted the study to the Japan International Cooperation Agency (JICA).

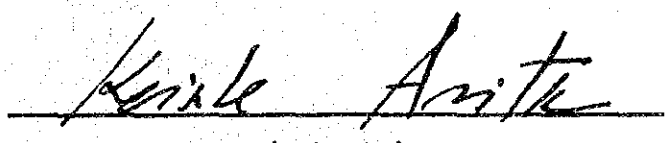
JICA sent to Malawi a study team headed by Mr. Takeshi Naruse, First Basic Design Study Division, Grant Aid Planning and Survey Department of JICA from July 12 to August 19, 1987.

The team had a series of discussions on the Project with the officials concerned of the Malawi Government and conducted a field survey in North Kawinga, Machinga District. After the team returned to Japan, further studies were made, a draft report was prepared, and for the explanation and discussion of it, a mission headed by Mr. Yoshikatsu Nakamura, First Basic Design Study Division, Grant Aid Planning and Survey Department of JICA was sent to Malawi from October 15 to October 26, 1987. As a result, the present report has been completed.

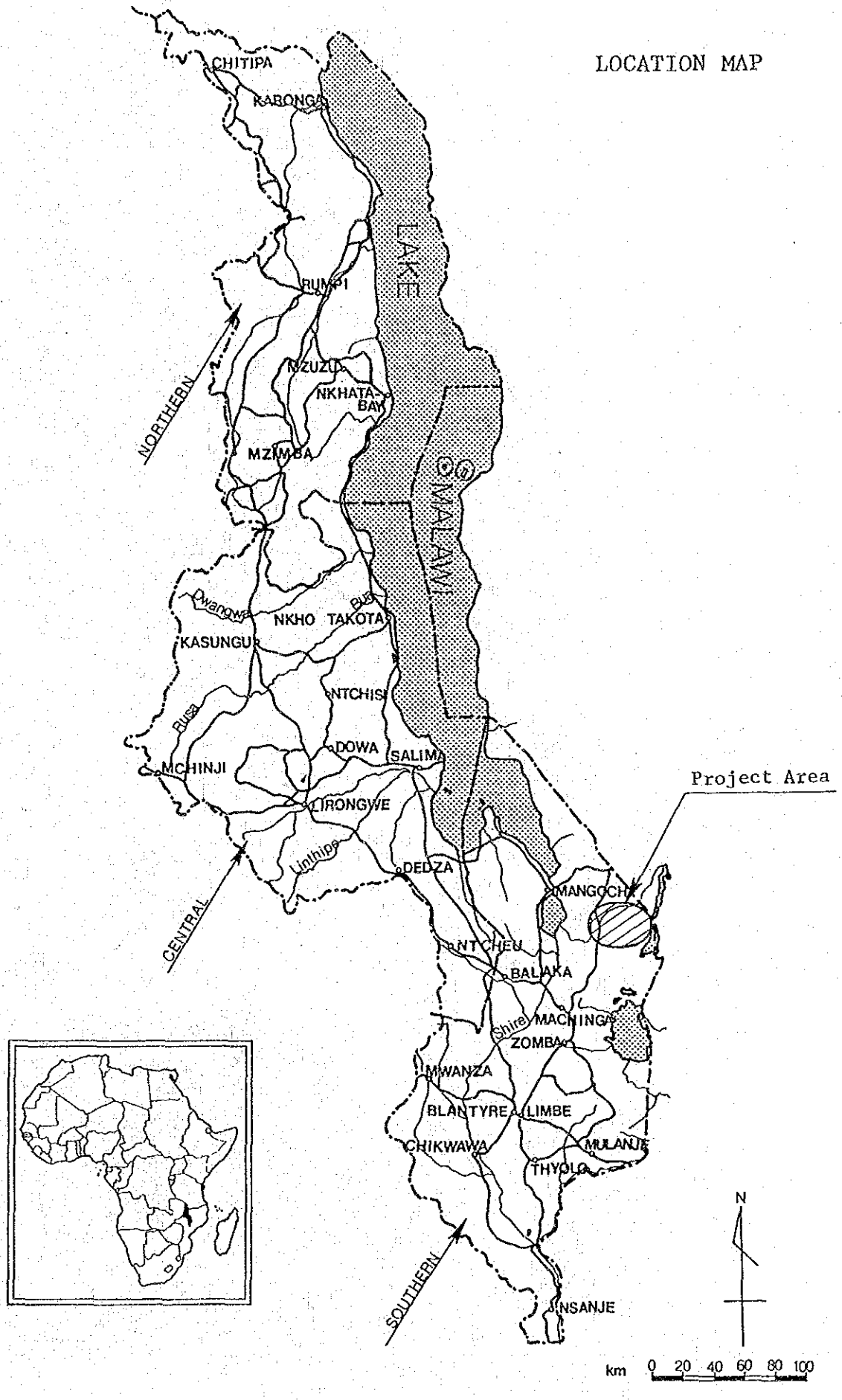
I hope that this report will serve for the development of the Project and contribute to the promotion of friendly relations between our two countries.

I wish to express my deep appreciation to the officials concerned of the Government of the Republic of Malawi for their close cooperation extended to the team.

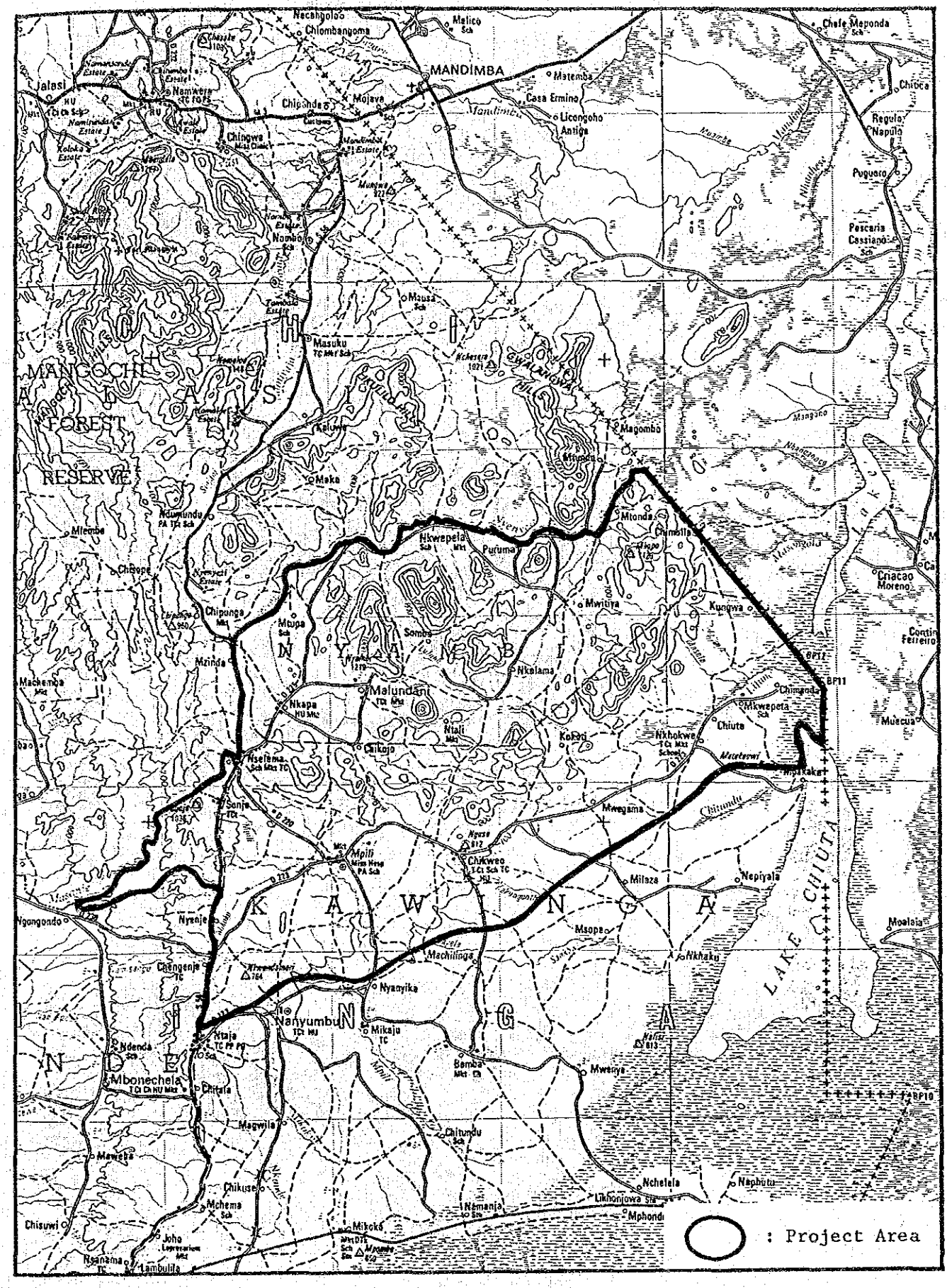
October, 1987



Keisuke Arita
President
Japan International Cooperation Agency


LOCATION MAP
CHITIPA
KABONGA
LAKE
RUMPI
NZUZU
NKHATA-BAY
NORTHERN
MZIMBA
MALAWI
Dwangwa
NKHO TAKOTA
Bua
KASUNGU
NTCHISI
Rusa
DOWA
SALIMA
MCHINJI
LIRONGWE
Project Area
Linthipe
DEDZA
CENTRAL
MANGOCHI
NTCHEU
BALAKA
Shire
MACHINGA
ZOMBA
MWANZA
BLANTYRE
LIMBE
CHIKWAWA
MULANJE
THYOLO
SOUTHERN
NSANJE
N
km
0 20 40 60 80 100

MAP OF THE PROJECT AREA



Existing borehole in North Kawinga (GM20)

(Pump is of the Limani type. People come to this borehole for water from villages more than 10 km away.)

Dugwell in North Kawinga

(The well has almost dried up and the water is opaque.)

Electric prospecting near Nkhokwe in the Project Area

(The borehole has been installed with a Climax type pump - W114.)

Bridge and stream in the east of Nkhokwe

Setting of electric prospecting wire near Mkwepele

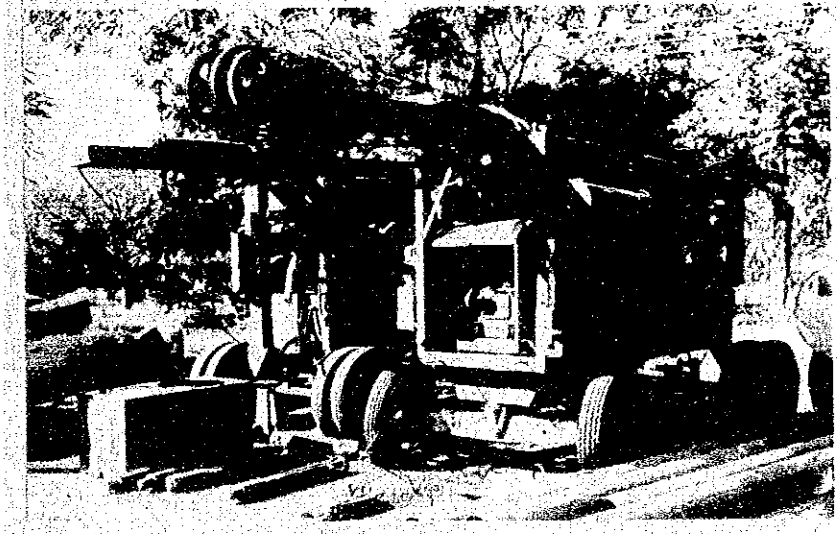
(Mountain at the back consists of syenite.)

Administrative office for the gravity piped water supply system in Ntaja

(Repair tools and pipes are stored inside.)

Water taps of the gravity piped water supply system in the southern part of Ntaja

Villagers helping to repair a borehole pump in the Livulezi Project Area



Disordered percussion type drilling rig in the Central Regional Workshop of the Department of Water in Lilongwe

SUMMARY

The Government of the Republic of Malawi announced its Statement of Development Policies (1971-1980) in 1971 which placed emphasis on agricultural development, and in line with this Statement, formulated the National Rural Development Programme (NRDP) in 1977 - 1978 which aimed at the "improvement of agricultural productivity", "increase of the unit yield through improved farming methods", and "protection of natural resources" for the benefit of rural inhabitants. This Programme is now in the process of moving from the preparatory phase to the extensive phase.

To attain the goals of the NRDP, affording a stable supply of sanitary domestic water has become a major task in developing the infrastructure for agricultural development and in prompting the permanent settlement of the rural inhabitants. Consequently the Government is pushing forward on a nationwide scale the development of groundwater resources and the construction of gravity piped water supply facilities as its two main policies in line with the United Nation's International Drinking Water Supply and Sanitation Decade (1981 - 1990). In this way, the Government aims to increase the water supply ratio to rural inhabitants from the current 33% of the population to 68% by the year 2005.

However, with its Groundwater Development Programme having already been considerably delayed due to financial constraints, the Government of the Republic of Malawi has judged the attainment of the goals of the Groundwater Development Programme by its own efforts to be difficult and has requested international organizations and advanced countries for economic assistance.

For the promotion of the aforementioned Programme, the Government of the Republic of Malawi has requested the Government of Japan for grant aid for the implementation of the Groundwater Supply Project in April, 1986, whereby 260 boreholes will be constructed (including rehabilitation of existing ones) for North Kawinga, Machinga District, Southern Region of Malawi.

In response to this request, the Government of Japan decided to conduct a basic design study for this Project, and the Japan International Cooperation Agency (JICA) subsequently dispatched a study team, to the Republic of Malawi for the period between July 12 and August 19, 1987, in order to review the Groundwater Supply Project in the area considered for the Project and also the suitability of the said Project.

The area considered for this Project is designated in the NRDP as a part of the extension planning area and is also one of the 15 areas for which the Government has formulated groundwater supply projects. Of all the extension planning areas designated in the NRDP, it is the area where the need for a stable supply of domestic water to the rural inhabitants is considered to be especially urgent.

As a result of the field survey and discussions with the Malawi side, the following basic matters related to this Project have been clarified.

1) This Project, by which a stable supply of domestic water using clean groundwater will be achieved will not only greatly contribute to the eradication of water shortages during the dry season, stabilization and improvement of farmers' lives, permanent settlement of the villagers, reduction of unproductive labour, and improvements in health and a sanitary environment but also to the acceleration of agricultural development. It therefore commands a high priority among all national projects.

2) The Project Area is located on a plateau which stretches along the east side of the Rift Valleys that traverse the African Continent longitudinally, and the Project mainly aims at exploiting the groundwater in the fissures of the weathered zones of Precambrian gneiss and of plutonic rocks, such as syenite and granite. Groundwater in these fissures is stored within a range of 60m in depth. This type of groundwater development is easily successful, and it is satisfactory both in terms of quality and quantity. The construction of boreholes in the Project Area is decided by the Malawi side in order to avoid duplication of the

efforts of other aid projects of foreign governments and international organizations.

3) North Kawinga, which is the Project Area, cultivates tobacco and other cash crops, and like all areas likewise confronted with a water shortage, it is given high priority in Malawi as an area in need of economic development. The construction of a gravity piped water supply system has been completed with foreign aid in the southern part of Kawinga adjacent to the Project Area, and the area to be covered by this Project is an area of about 650km^2 mainly composed of MGA 9 and 10 in the Machinga District, but excluding the area already covered by the aforementioned gravity piped water supply system (see Fig. 3-1).

4) The content of the request is the construction of 260 boreholes, one borehole for every 250 persons, in order to supply 27ℓ/capita/day of water to an estimated population of 65,000 as of 1990 in the target area. The 260 boreholes include those existing boreholes that are scheduled to be rehabilitated. Wells (water supplying facilities) will supply clean groundwater for use by the villagers, and the boreholes will be 100mm in diameter with an average drilling depth of 60m and will be of the hand-pump type.

Following the reviewing of the said Groundwater Supply Project based on the results of the field survey, the following basic matters regarding the Grant Aid Project have been decided on.

(1) Target Beneficiaries

The target beneficiaries will be the estimated population of 65,940 persons projected for the area in 1990, which excludes the population of the gravity piped water supply district of MGA 9 and 10 but includes part of the population of MGA 8 and 11 where water is not yet supplied.

(2) Required Number of Boreholes to be Constructed

The required number of boreholes is 263 if simply calculated from the estimated 1990 population of 65,940 persons for the Project Area and the target supply population of 250 persons per borehole. However, when small villages with a population of 125 persons or less are excluded and the population distribution by village is taken into account, the required number of boreholes totals 255. It is naturally desirable to supply water even to those villages with a population of less than 125 persons, but as this would make the Project overly large at this stage when the water supplying facilities are still underdeveloped, it would be more appropriate to work out the plan with emphasis on population distribution for the time being.

The Project includes the rehabilitation of existing boreholes, excluding the boreholes found in the field survey to have problems of either water quality or quantity, and the target number of boreholes to be constructed consists of 239 new boreholes and 16 existing boreholes scheduled for rehabilitation.

(3) Average Drilling Depth of the Planned Boreholes

Although the requested average depth is 60m, the average drilling depth of the boreholes of this Project will be 45m based on the results of the field survey.

(4) Borehole Construction Plan

When the meteorological conditions of Malawi are taken into account, the actual working period will be eight months per year, and the construction of new boreholes with two of rotary-air hammer type drilling rig units will take three years. The construction plan, therefore, calls for the construction of 80 boreholes in the first year, 80 boreholes in the second year and 79 boreholes in the third year.

Construction of the boreholes in the first and second years will be particularly important in view of the smooth implementation of the rest of the Project and must be implemented by a Japanese contractor. The work in the third year will be implemented by the Malawi side. Rehabilitation of the existing boreholes will be implemented in the third year as some of them are currently in operation.

(5) Quantities of Machines, Equipment and Materials

Although the borehole construction work will extend over a period of three years, it is preferable not to provide all of the machines, equipment and materials necessary for the work in bulk for security and management reasons. Accordingly, machines, equipment and materials in quantities necessary for the construction of 160 new boreholes during the initial two years with two drilling rig units will be provided.

80本/年 × 2 = 160本/2年

(6) Technical Assistance

As the Department of Water which is responsible for this Project has no experience in working with rotary-air hammer type drilling rigs, the provision of which is requested, the technical staff of the Department of Water shall participate in on-the-job training to receive technical guidance during the initial two years' construction work which will be implemented by a Japanese contractor in order to master the necessary basic drilling technique of the new type drilling rig.

In order to smoothly implement the Project, the provision of the following machines, equipment and materials as well as the construction of boreholes, under grant aid from the Government of Japan is judged to be necessary.

1) Truck mounted drilling rig (rotary-air hammer type, with high pressure air compressor, tools and accessaries) — 2 units

2)	Truck-mounted test pumping equipment	2 units
3)	Electric prospecting equipment and other testing equipment	2 sets
4)	Vehicles for material transport, liaison and support	8
5)	Motorcycles (for maintenance)	2
6)	Borehole construction materials (casing, screen, spare parts, drilling mud,etc.)	for 160 B/H
7)	Pumps	160 sets
8)	Communication equipment	1 unit
9)	Repair equipment	1 unit
10)	Base camp equipment	1 set
11)	Other machines, equipment and materials necessary for constructing boreholes	1 set
12)	Construction of 160 boreholes	1 set

Of the Japanese grant aid mentioned above, the provision of the machines, equipment and materials stated in the preceding items 1) - 11) will be firstly implemented and the construction of the boreholes stated in item 12) will be implemented thereafter.

The rough project cost to be borne by the Government of the Republic of Malawi, covering equipment and material costs and personnel cost, is estimated to total K 3,607,000. (approximately ¥232,000,000) which appears appropriate in view of the contents of the Project.

The procedure for implementing the Project will begin with the conclusion of a contract with a contractor after the signing and exchanging of Notes, followed by the procurement and transportation of the machines, equipment and materials to be granted, their inspection for acceptance and delivery, and finally the full-scale construction of the boreholes.

The implementing agency of the Project is the Department of Water, Ministry of Works and Supplies, the Government of the Republic of Malawi, which will assume overall responsibility. The Department of Water is a service organization which undertakes the planning, execution, maintenance and operation of rural groundwater supply projects on a national level and is quite experienced in such groundwater supply projects as it has undertaken a number of them in the past with the assistance of foreign governments and international organizations.

The maintenance system for this Project may be divided into maintenance of boreholes as water supply facilities and maintenance of the machines, equipment and materials for constructing boreholes. When boreholes are constructed under a national project, a maintenance committee is organized for each borehole by the local inhabitants, and the borehole will be managed and operated by the said committee. An engineer is dispatched from the Department of Water and is responsible for 100 boreholes. His assignment is to inspect and maintain the boreholes in good condition so that they can provide a stable supply of water to the inhabitants at all times. His assignment also includes the provision of guidance to the inhabitants to develop a sanitary environment. This maintenance system has been used since 1983 for all boreholes completed under national groundwater supply projects, and the Department of Water has achieved satisfactory results with it.

The Ministry of Works and Supplies has repair shops for vehicles and the like distributed throughout the country, while the Department of Water also has its own repair shops and storages facilities and has organized operating organizations specializing in each particular field. Thus, the Malawi side, being equipped with a good maintenance system, should have no trouble in maintaining the machines, equipment and materials provided for the implementation of the Project.

A stable supply of clean domestic water is one of the basic for human existence and, therefore, its provision is of extreme public benefit. For the Government of the Republic of Malawi, which has long been suffering

from a chronic shortage of water in its rural areas due to inadequate water supply facilities, the promotion of the Groundwater Development Programme is a crucial task of the utmost urgency. However, due to financial constraints on the Government of the Republic of Malawi, the Government is not only lagging behind in this Groundwater Development Programme but it is in the position of being unable to successfully accomplish the said Programme by itself. Accordingly, the economic cooperation of the Government of Japan on this Project, by which it will become possible to secure a stable supply of domestic water in the Project Area, will be highly effective in improving the living environment, reducing unproductive labour hours, prompting settlement of rural inhabitants and reducing the incidence of water-borne diseases and will eventually enable the recipient government to establish policy measures for the increased production of agricultural crops, and socioeconomic development, etc. Thus, the Project is judged to be highly appropriate in the light of the intent of grant aid cooperation programmes of the Government of Japan.

BASIC DESIGN STUDY

ON

THE PROJECT FOR NORTH KAWINGA GROUNDWATER SUPPLY

IN

THE REPUBLIC OF MALAWI

Table of Contents

APPENDICES:

CHAPTER 1 INTRODUCTION

Agriculture commands an extremely important position in the economy of the Republic of Malawi. Some 90% of the total population (estimated at 7.06 million in 1985) is engaged in agriculture and the share of the agricultural sector in the GDP is as high as 40%. Since Malawi's independence, the Government has steadily considered the promotion of agriculture to be one of its most important policy measures and the National Rural Development Programme (NRDP) was prepared in 1977 through 1978 to accelerate agricultural development and the settlement of rural inhabitants. This Programme is now in the process of moving from the preparatory phase to the extensive phase.

However, as the Programme's advancement has been hindered by the shortage of domestic water for rural inhabitants, a sanitary and stable supply of groundwater has become increasingly essential. The Groundwater Development Programme has, therefore, been implemented nationwide pursuant to the International Drinking Water Supply and Sanitation Decade of the UN. A number of boreholes and dugwells and gravity piped water supply facilities have been constructed with the result that approximately 2.87 million rural inhabitants are now supplied with water at a water supply ratio of 33%. The Government intends to increase this ratio to 68% by the year 2005.

After examining the water supply project prepared for individual regions as part of the nationwide programme, the Government of the Republic of Malawi has found it impossible to proceed with the Groundwater Development Programme without outside help due to financial difficulties and has accordingly requested economic assistance to this end from various international organizations and industrialized countries.

In view of the above-described domestic circumstances, the Government of the Republic of Malawi requested the Government of Japan grant aid for the implementation of the Grandwater Supply Project in North Kawinga of the Machinga District in April, 1986. Upon receipt of this request, the Government of Japan decided to conduct a basic design study.

Commissioned by the Government of Japan, the Japan International Cooperation Agency (JICA) then sent to Malawi the basic design study team, headed by Takeshi Naruse of JICA's Grant Aid Planning and Survey Department, for the period between July 12 and August 19, 1987 to prepare the Groundwater Supply Project for the Project Area and to study its justifications.

The study team discussed the contents of the request with officials of the Government of the Republic of Malawi, conducted field surveys and collected data concerning the water supply and borehole and dugwell construction conditions in the Project Area. Following the discussions with the Malawi officials, the items basically agreed to were compiled as the Minutes of Discussions which were then signed and exchanged by representatives of both parties at Malawi's Ministry of Finance on July 24, 1987.

The Minutes of Discussions, Itinerary of the Study, List of the Study Team Members, List of Interviewees, General Data and List of Collected Data, etc. are attached to this report as appendices.

Upon its return to Japan, the study team conducted a comparative study based on the field survey results, prepared the basic design, selection of the required machines, equipment and materials, implementation plan, project cost estimate and the maintenance plan for the borehole construction facilities and also examined the Project's justifications. The results of the above studies and examinations are hereby compiled in this report.

CHAPTER 2 BACKGROUND OF THE PROJECT

2-1 Outline of Malawi

2-1-1 Geography and Topography

Located between Lat. 9°30' and 17°10'S and Long. 33° and 36°E, Malawi is an landlocked country lying in the south-eastern part of Africa and to the west of Lake Malawi. It covers an area of 118,484km^2, of which more than 20% consists of lakes and marshes, Lake Malawi being the largest. Malawi's narrow strip and land stretches a distance of some 855km in the north-south direction along the East African Rift Valleys and is bordered by Tanzania on the opposite side of Lake Malawi to the north, Zambia to the west and Mozambique to both the east and south. The capital was changed from Zomba to Lilongwe in 1975 and has been the centre of national development ever since.

Topographically, Malawi is largely composed of rift valley plains, rift valley escarpments, plateaus and isolated areas of highland, as shown in Fig. 2-1. It belongs to the southern part of the East African Rift Valleys with rift valley plains running in a north-south direction at 400-600m above sea level which include Lake Malawi, the plains along the Shire River adjacent to Lake Malawi and the plains around Lake Chilwa.

From the southern tip of Lake Malawi, the Shire River flows towards the south, joining with the Zambezi River in Mozambique, and the Shire Valley extends for some 400km to the south along the Shire River. The plateau areas on both sides of the rift valley are 900-1,300m above sea level, occupying some 75% of Malawi's total land area.

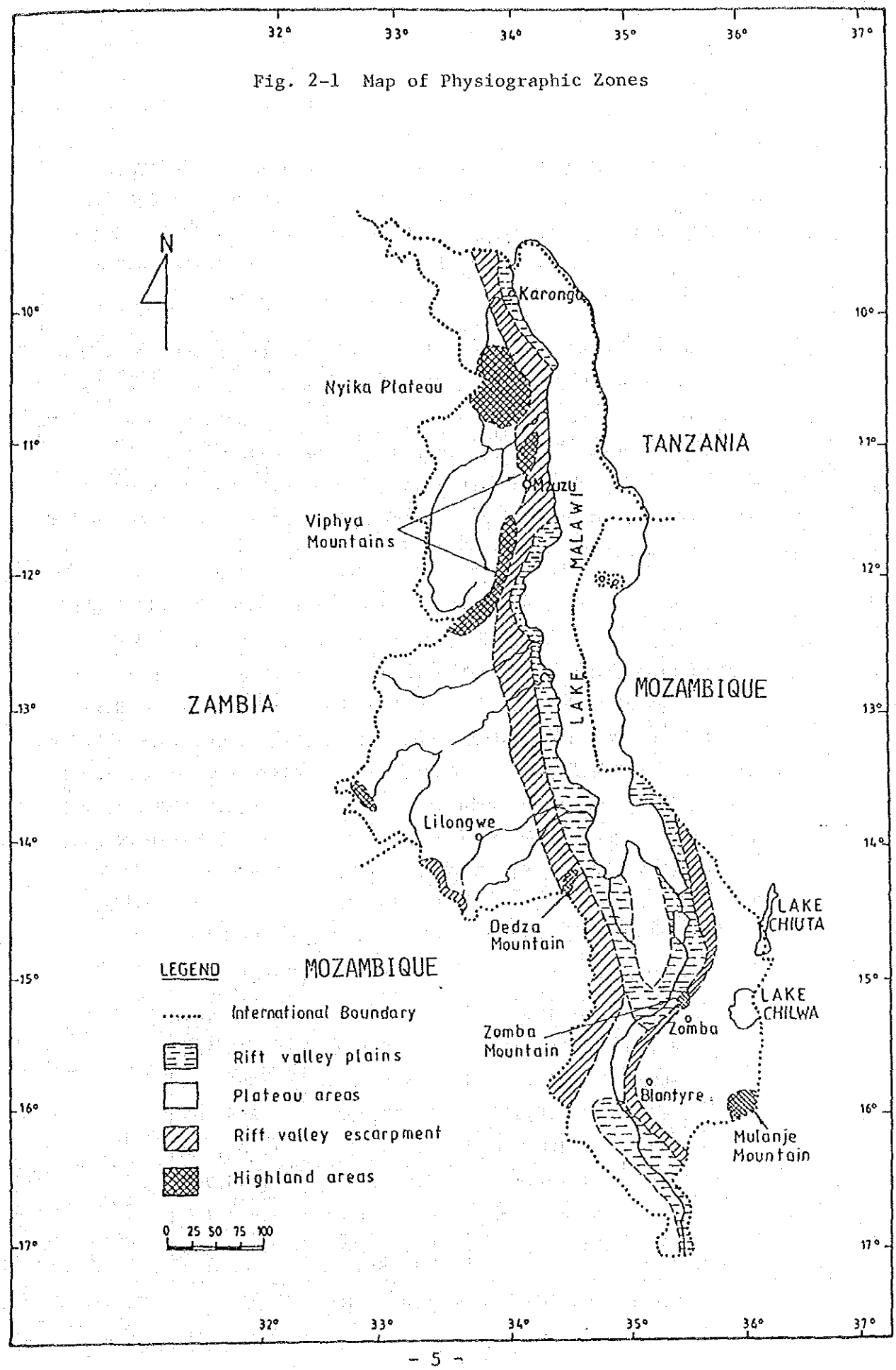
There are scattered highland areas with elevations of around 2,400m, the most conspicuous being Nyika Plateau in the northern part of the country, the Viphya Mountains and Dedza Mountain in the

central part and Zomba Mountain (highest elevation: 2,085m) and Mulanje Mountain (highest elevation: 3,000m) in the southern part.

2-1-2 Climate

Malawi belongs to the tropical savanna zone and has a variable climate despite its rather small land area which is long and narrow stretching in the north-south direction with many undulations. It has alternative dry (April - November) and rainy (December - March) seasons and over 90% of the annual rainfall is recorded during the latter. The mean annual rainfall is 1,500-2,000mm along Lake Malawi in the northern part of the country, decreasing to less than 900mm in the inland areas, while 800-900mm, 900-1,300mm and over 2,000mm are recorded for the southern plains, plateaus and mountains respectively. November is the warmest month and June and July are the coldest and the annual temperature fluctuation range is approximately 7-8°C. The mean annual temperature is 24-26°C for the plains, 19-22°C for the plateaus and 13-17°C for the mountains.

Fig. 2-1 Map of Physiographic Zones



2-1-3 Population

Since it became independent, Malawi has conducted a national census on two occasions, in 1966 and 1977. Using a national average population growth rate of 2.9%, in turn inferred from the census results, the National Statistical Office estimated the population from 1978 to 2005 to be as shown in Table 2-1.

A concentration of the population is seen in the southern part of the country which has almost 50% of the total population while only some 12% lives in the northern area. The average population density was formerly 87 persons/km^2, 60 persons/km^2 and 24 persons/km^2 for the southern, central and northern parts of Malawi respectively. However, the respective densities increased in 1982 to 97 persons/km^2, 90 persons/km^2 and 20 persons/km^2.

As well as the transfer of the capital to Lilongwe in 1975, new investment in agricultural development and transport network construction has been promoted in the northern and central parts of the country in view of rectifying the disproportionate distribution of the population. However, while the population inflow to urban areas has been accelerating, a declining tendency can be seen in the population ratio of the northern area. Although the urban populations stood at 12% in 1985, Malawi has a relatively low degree of urbanization among developing countries.

Table 2-1 Estimated Population of Malawi

Year	Total	Rural	Urban
1978	5,683,300	5,179,800	503,500
1980	6,045,700	5,454,700	591,000
1985	7,058,800	6,193,200	865,600
1990	8,288,900	7,023,100	1,265,800
1995	9,787,800	7,941,900	1,845,900
2000	11,630,500	8,948,400	2,682,100
2005	13,867,700	10,410,900	3,465,800

Source: National Statistical Office

2-1-4 Races, Languages and Religions

Malawi has many tribes, the largest being the Chewa and Nyanja tribes (almost half of the total population and living in the central and southern parts of Malawi), the Lomwe tribe (some 20% of the total population and living in the south-east) and the Ngoni tribe (some 10% of the total population and living in the north). Although each tribe has its own language, Chichewa is the national language while English is used as the official language. Christians and Muslims comprise some 35% and 12% of the population respectively and the remainder is considered to believe in the traditional animism.

2-1-5 Political Administration

Malawi declared its independence on July 6, 1964. Dr. Hastings Kamuzu Banda was inaugurated as the first president in July, 1966 and subsequently elected to life-presidency in July, 1971. One-party rule (the Malawi Congress Party) is exercised under President Banda. Several cabinet reshuffles have occurred with the introduction or the abolition of ministries. As political power is entirely in the hands of President Banda, national unification has been continuously attempted since independence under the President's strong leadership. Fig. 2-2 shows the organization of Malawi's political administration as of December, 1985.

2-1-6 Foreign Assistance

Bilateral economic cooperation by DAC countries in 1983 as shown in Table 2-2, stated Britain which was the ex-suzerain country, and West Germany to have overwhelming importance, providing 16.2% and 14.3% respectively of the total assistance to Malawi. In the case of international organizations, the World Bank has an overwhelming share of 23.4%.

Fig. 2-2 Organization Chart of Malawi's Political Administration (as of December, 1985)

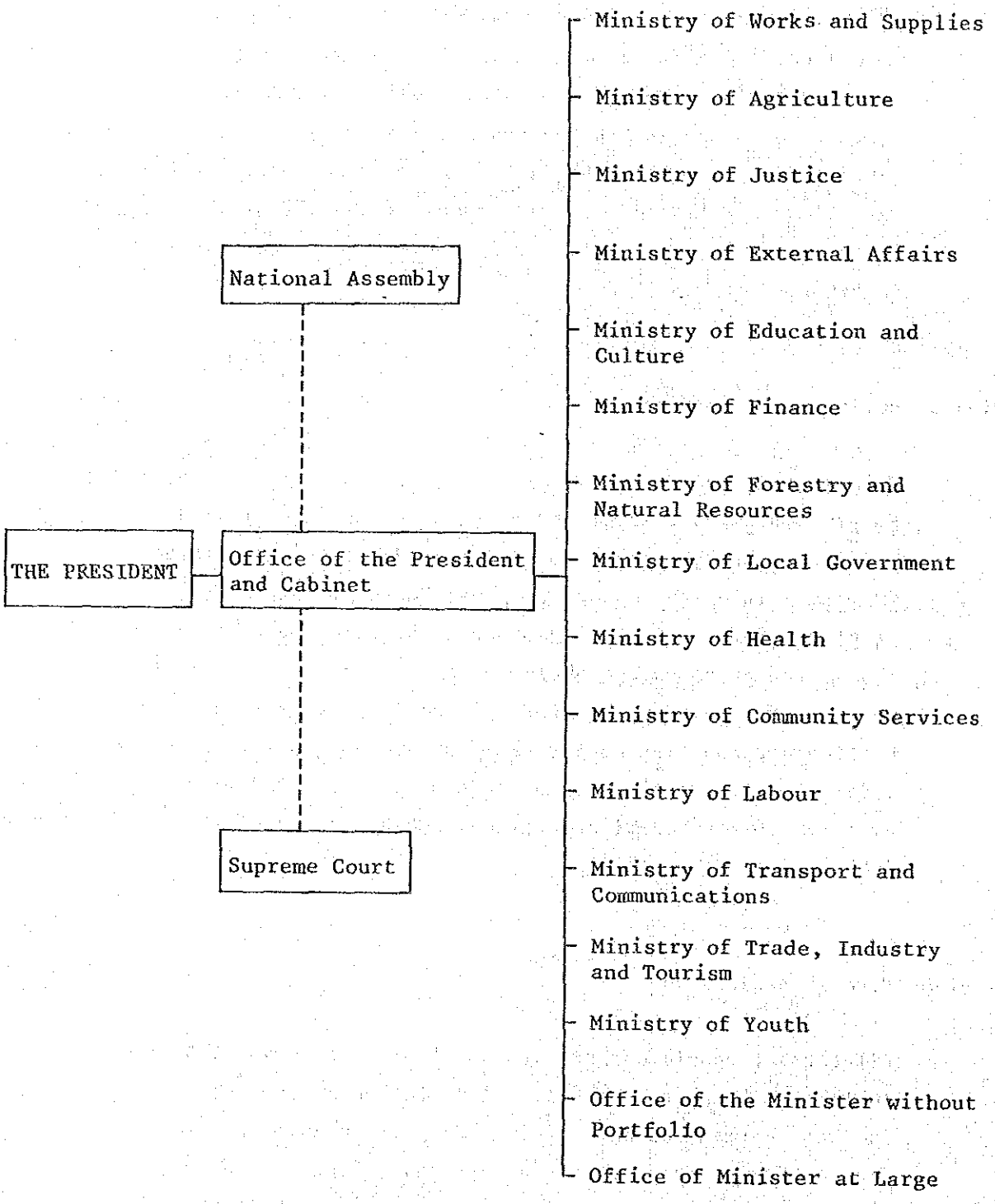


Table 2-2 Assistance of DAC Countries and International Organizations to Malawi (1979 - 84)

		DAC Country										International Organization						Grand Total
		U.K.	West Germany	Canada	Japan	U.S.A.	Nether-lands	Denmark	Others	OPEC Countries	sub-total	IBRD /IDA	EC	AfDB /AfDF	UNDP	Others	sub-total	
1979	Grant	33.5	50.3	13.3	2.0	1.0	2.0	17.4	0.3	-	119.9						17.4	137.4
	(TC)*	(11.6)	(5.7)	(1.3)	(2.0)	(1.0)	(1.9)	(1.5)	(0.2)	(-)	(25.3)						(4.7)	(30.0)
	Loan	Δ0.2	Δ21.8	-	4.8	2.0	2.5	Δ15.3	-	-	Δ27.9						32.3	4.4
	Total	33.2	28.6	13.3	6.9	3.0	4.5	2.2	0.3	-	92.0	21.3	12.7	2.0	3.6	10.2	49.7	141.8
1980	Grant	26.8	13.2	9.0	2.7	2.0	2.4	1.6	0.6	-	58.2						26.7	84.9
	(TC)	(14.6)	(4.8)	(1.3)	(2.4)	(1.0)	(2.0)	(1.6)	(0.6)	(-)	(28.1)						(8.3)	(36.4)
	Loan	Δ1.5	-	-	8.8	1.0	4.6	4.4	-	-	17.4					12.9	41.0	58.4
	Total	25.4	13.2	9.0	11.6	3.0	7.0	6.0	0.6	-	75.6	18.5	20.6	10.9	4.9	12.9	67.7	143.3
1981	Grant	28.9	29.4	10.0	4.1	2.0	2.1	1.0	0.8	-	78.3						25.6	103.9
	(TC)	(12.6)	(5.5)	(0.8)	(3.2)	(2.0)	(1.8)	(1.0)	(0.8)	(-)	(27.7)						(10.5)	(38.1)
	Loan	Δ4.0	Δ4.5	-	5.8	2.0	0.5	0.6	3.3	-	3.7						30.0	33.7
	Total	24.9	24.9	10.0	9.9	4.0	2.5	1.6	4.1	-	82.1	20.5	14.0	6.3	8.1	6.6	55.5	137.6
1982	Grant	23.8	21.7	6.6	4.2	4.0	1.9	1.2	0.9	0.1	64.3						21.9	86.2
	(TC)	(11.4)	(5.3)	(0.3)	(3.1)	(3.0)	(1.6)	(1.2)	(0.8)	(-)	(26.7)						(10.5)	(37.2)
	Loan	Δ3.6	-	-	1.5	-	0.6	2.2	0.2	-	0.8						34.2	35.0
	Total	20.2	21.7	6.6	5.7	4.0	2.5	3.3	1.1	0.1	65.1	26.1	10.8	5.9	8.0	5.5	56.1	121.2
1983	Grant	17.5	14.5	7.8	5.1	6.0	1.6	0.7	3.3	-	56.5						17.5	74.1
	(TC)	(10.6)	(3.9)	(1.0)	(2.3)	(4.0)	(1.5)	(0.5)	(1.1)	(-)	(24.9)						(9.9)	(34.8)
	Loan	Δ2.4	-	-	-	-	0.7	0.3	1.2	-	Δ0.3						43.0	42.7
	Total	15.1	14.5	7.8	5.1	6.0	2.3	0.9	4.5	-	56.3	29.2	5.8	5.7	7.2	12.9	60.6	116.8
1984	Grant	16.3	14.7	3.3	5.3	6.0	1.2	1.5	2.0	-	50.3						24.5	74.8
	(TC)	(9.3)	(8.3)	(-)	(2.5)	(6.0)	(1.2)	(0.9)	(1.2)	(-)	(29.4)						(10.2)	(39.6)
	Loan	Δ2.0	-	-	1.1	Δ1.0	0.1	1.6	1.6	-	1.4						82.3	83.7
	Total	14.3	14.7	3.3	6.4	5.0	1.3	3.0	3.7	-	51.7	76.0	14.5	3.3	7.9	5.2	106.8	158.5
1979-84 Total	Grant	146.8	143.8	50.0	23.4	21.0	11.2	23.4	7.9	0.1	427.5						133.6	561.3
	(TC)	(70.1)	(33.5)	(4.7)	(15.5)	(17.0)	(10.0)	(6.7)	(4.7)	(-)	(162.1)						(54.1)	(216.1)
	Loan	Δ13.7	26.3	-	22.0	4.0	9.0	Δ6.2	6.3	-	Δ4.9						262.8	257.9
	Grant Total	133.1	117.6	50.0	45.6	25.0	20.1	17.0	14.3	0.1	422.8	191.6	78.4	34.1	39.7	52.6	396.4	819.2

*(TC): Technical Cooperation

(Net Disbursement, Unit: Million Dollars)

Source: DAC Data

2-1-7 Economy

Malawi is located in the south-east of the African continent and has a relatively high population density for its small size. It has no mining resources worth exploiting and its national resources are considered to be its climate and land which are suitable for agriculture, and water as represented by Lake Malawi. Agriculture forms the core of Malawi's economy, accounting for 40% of the GDP and with some 90% of the population dependent on it. Economic policies since independence have mostly focussed on the agricultural sector.

The country became a British protectorate in 1891 and for the subsequent fifty years, economic development was carried out under Britain's colonial policies. At the time of its independence in 1964, Malawi was the most undeveloped country of the three countries forming the Federation of Rhodesia and Nyasaland. The GNP per capita in 1965 was only 60 dollars compared to the 250 dollars and 220 dollars for Zambia and Zimbabwe (Rhodesia) respectively. Following independence, however, Malawi made steady economic growth, achieving 6.8% average annual growth rate of the GDP between 1967 and 1979. Nevertheless, the GNP per capita still remained as low as 210 dollars due to the high rate of population growth. Although the steady economic growth continued upto the late 1970's, the increase of the GDP has slowed in the 1980's, recording a mere 2.5% average annual growth rate between 1980 and 1985. Table 2-3 shows the transition of the real GDP by industrial sectors.

Table 2-3 Transition of Real GDP by Industrial Sectors

(Unit: Million Kwacha)

	1980	1981	1982	1983	1984	1985
Agriculture	284.1	260.7	278.8	290.6	308.8	313.9
(Large Scale)	(231.2)	(210.7)	(216.9)	(224.7)	(243.3)	(247.2)
(Small Scale)	(52.9)	(50.0)	(61.8)	(65.9)	(65.5)	(66.7)
Manufacturing	89.0	92.0	91.8	98.3	101.5	106.6
Public Works	14.1	14.3	14.6	15.8	16.5	17.1
Construction	41.3	34.3	33.6	31.6	32.1	33.4
Commerce	109.3	98.1	94.9	102.6	111.2	119.5
Transportation	52.1	47.7	46.8	44.9	49.9	53.4
Finance/Expert Technical Services	51.4	47.4	47.4	50.7	53.4	56.6
Housing	32.3	31.7	36.2	33.9	35.2	37.0
Private Services	29.1	30.5	31.0	33.2	34.3	35.5
Public Services	79.0	85.1	89.8	93.8	106.2	112.1
Imputed Interest	Δ20.7	Δ19.1	Δ19.5	Δ20.4	Δ21.5	Δ22.7
GDP (at Factor Cost)	761.0	722.7	741.7	775.1	827.6	862.4

Source: Economic Report, 1985

This slow down can be explained by the following constraints on Malawi's economy at the time.

(1) Deterioration of trade conditions due to increased energy prices and the FOB prices of petroleum products in 1979 and 1980, in turn caused by high inflation in industrialized countries.

(2) Collapse of the transportation routes to overseas markets.

(3) Conspicuous decline of new investment due to the completion of major infrastructure projects.

2-1-8 Trade Balance

Malawi has the typical trade structure of a developing country, exporting such primary products as tobacco, tea and sugar and the processed products and importing industrial products.

Malawi's trade balance has shown a constant deficit since independence, showing a surplus for the first time ever in 1984 due to the rapid increase of exports. Exports totalled 446 million kwacha, an increase of 64% on the previous year, due to the recovery of the tobacco price after a long recession, the increase of the tea price and good major agricultural product sales carried over from the previous year. In 1985, however, exports declined to 419 million kwacha, a 6% decrease on 1984, due to the decline of the export prices of major agricultural products and the recovery of the import demand using the 1984 trade profits. Accordingly, imports in 1984 increased by 5% on 1983 to 381 million kwacha and further recorded a 29% increase in 1985 on 1984. Malawi's trade trend is shown in Table 2-4.

Britain is Malawi's main customer, followed by the US, with some 38% and 15% respectively of the total export amount. In the case of imports, South African is the main supplier with some 38% of the total import amount, followed by Britain and Japan, both with 11%.

Tables 2-5, 2-6 and 2-7 show the Japanese trade trend with Malawi, Japanese exports to Malawi and Japanese imports from Malawi respectively based on the Ministry of Finance's customs clearance statistics.

Table 2-4 Trade Trend of Malawi

(Unit: Thousand Kwacha)

	1979	1980	1981	1982	1983	1984	1985
Exports (Re-exports)	181,708 (5,403)	231,007 (12,700)	243,670 (11,271)	256,579 (7,593)	270,610 (5,443)	446,232 (9,691)	419,588 (11,240)
Imports	324,838	357,207	313,413	320,099	363,752	381,573	492,500
Balance	Δ143,130	Δ126,200	Δ69,743	Δ65,520	Δ93,142	64,659	Δ72,912
Import/Export Ratio	1.79	1.55	1.29	1.26	1.34	0.87	1.17

Source: Economic Report, 1985

Table 2-5 Japanese Trade Trend with Malawi

(Unit: Million Yen)

	1980	1981	1982	1983	1984
Japanese Exports to Malawi	4,760	3,347	3,351	2,976	3,110
Japanese Imports from Malawi	994	2,439	3,184	2,244	2,885
Balance of Japan	3,765	907	167	732	225
Export/Import Ratio	4.79	1.37	1.05	1.33	1.08

Source: Ministry of Finance's Customs Clearance Statistics

Table 2-6 Japanese Exports to Malawi

(Unit: Million Yen)

	1980	1981	1982	1983	1984
Food	4	2	12	17	28
Fuel	1	3	3	3	-
Light Industries	914	972	927	557	562
(Textile)	(700)	(781)	(795)	(435)	(440)
Heavy Industries	3,619	2,362	2,406	2,394	2,519
(General Machine)	(180)	(194)	(151)	(332)	(273)
(Electric Machine)	(1,790)	(592)	(174)	(282)	(214)
(Transport Machine)	(986)	(1,059)	(1,246)	(1,320)	(1,548)
Sepcial Handling Re-exports	221	8	3	5	1

Source: Ministry of Finance's Customs Clearance Statistics

Table 2-7 Japanese Imports from Malawi

(Unit: Million Yen)

	1980	1981	1982	1983	1984
Tobacco Leaves	983	2,361	3,012	2,065	2,777
Waiste Tobacco	3	48	141	170	100
Total	986	2,409	3,153	2,234	2,877

Source: Ministry of Finance's Customs Clearance Statistics

2-1-9 Industry

(1) Agriculture

The agricultural sector plays a key role in Malawi's economy. In 1983, 40% of the GDP was accrued from agriculture and over 90% of the total exports were accounted for by agricultural products and their processed products. In addition, 90% of all domestic workers are employed in the agricultural sector.

Agriculture in Malawi is largely classified into small-scale independent farming and estate farming. Estate farming presupposes free land ownership or land lease while independent farming is carried out on public land. In terms of agricultural production and sales activities, government assistance focuses on independent farmers who are the majority of the population.

Since the small-scale independent farming sector mostly consists of self-sufficient farmers, actual figures indicating the growth trend of this sector are not available. It is, however, estimated that real average growth of some 3% was recorded in the late 1970's.

The small-scale independent farming sector accounts for 75-80% of the total agricultural production, producing not only maize (the country's major crop), pulses, groundnuts and rice, but such cash crops as dried tobacco and cotton. The sector also contributes to the national economy in terms of raw material supply to the domestic industry and the export of excess products. Exports from this sector accounted for 25% of the total exports in 1979.

In comparison, estate farming is mainly engaged in the production of such cash crops as dried tobacco, burley, tea and sugar. This sector accounts for 15% of the total agricultural production and more than two-thirds of the total exports.

Development of Malawi's agricultural sector has so far mainly concentrated on the simple expansion of farmland. In the light of the high population growth rate, however, higher productivity using fertilizers, high yield varieties and the upgrading of crops will be of crucial importance in the future in order to maintain the self-sufficient food supply as well as to obtain a higher export income. The consolidation of the economic infrastructure in rural areas will also be required.

(2) Industry

The industrial sector of Malawi can be summarized as an agricultural product processing industry due to the scarce mineral resources, mainly producing export products, intermediate goods for import substitution and consumer goods. The most important are the food/drink, textile/leather and the tobacco/tea industries.

Table 2-8 Industrial Production Index

(100: 1970)

	Weight	1979	1980	1981	1982	1983	1984
Total	100.0	220.7	223.9	246.9	232.3	269.9	271.7
Production for Domestic Consumption	80.0	220.8	229.5	263.5	240.5	288.9	273.0
Consumer Goods	62.0	234.7	252.5	303.9	281.7	339.6	320.6
Food/Drink/Tobacco	33.0	273.9	292.9	374.5	370.1	428.4	409.2
Footwear/Clothes/ Textiles	14.0	169.2	149.4	170.6	181.4	187.1	175.7
Others	15.0	205.2	259.7	273.0	180.0	286.7	260.7
Intermediate Goods	18.0	172.4	150.4	124.3	98.4	113.3	109.1
Production for Export	20.0	220.0	201.6	180.6	199.8	194.3	266.5

Source: Monthly Statistical Bulletin, April, 1985

2-2 Outline of National Rural Development Programme

Since its independence, Malawi has continuously promoted policies focusing on agricultural development and, in 1971, announced the following policies in its Statement of Development Policies 1971-1980.

(1) Improvement of agricultural productivity to improve the living standard in rural areas, to create employment opportunities and to obtain foreign currencies.

(2) Improvement of regional balance in terms of economic development by the implementation of rural development projects.

(3) Promotion of Malawization in terms of the employment of skilled and semi-skilled workers and company ownership.

(4) Termination of dependence of ordinary government expenditure on foreign fund.

The NRDP (National Rural Development Programme) was prepared in 1977/1978 on the basis of the above Statement, subjecting inhabitants in rural areas who comprise more than 90% of the employed population. The main objectives of the Programme are 1 the improvement of agricultural productivity, particularly that of cash crops for export, to secure a food supply for the steadily increasing urban population, 2 the increase of the unit yield by the improvement of farming methods and crop varieties and the introduction of new varieties and fertilizers and 3 the protection of natural resources.

1) Preparatory Phase (1979/80 - 1984/85)

This is the preparatory period where detailed studies on the land and agricultural economy are carried out. Test farming may be conducted if deemed necessary. In addition, the minimum road construction work and the assignment of project staff are carried out in this phase.

2) Extensive Phase (1985/86 - 1989/90)

This is the first implementation period where the improvement of agricultural technology extension is improved and farmer training, the provision of fertilizers and the construction of the basic infrastructure are carried out.

3) Intensive Phase (1990/91 - 1994/95)

This is the second implementation period where those projects implemented in the above phases are further elaborated to facilitate the study and introduction of new varieties for intensive farming, the exploitation of new land for permanent residency, land management, animal husbandry and the construction of additional infrastructure.

4) Consolidation Phase (1995/96 - 1999/2000)

This is the final period where the projects completed in the aforegoing three phases are integrated to further improve the social infrastructure, including education, health care and local industries.

In the implementation of the NRDP, the stable supply of sanitary groundwater appeared as a bottleneck in the development of the infrastructure for agricultural development and the facilitation of village settlement and, therefore, the Government of the Republic of Malawi has actively been implementing water supply and sanitation projects. As shown in Table 2-9, budgetary appropriation was made in 1981 onwards for these projects. The expenditure includes the appropriation for urban water supply projects and most of the funds were provided by foreign governments or international organizations.

Table 2-9 Expenditure for Water Supply and Sanitation Projects

(Unit: Million KW)

	Development Expenditure	
	Total	Water Supply and Sanitation
1981/1982	124.17	6.13
1982/1983	139.58	8.79
1983/1984	142.91	6.62
1985/1986	134.15	6.75

At the same time, the Government of the Republic of Malawi also prepared long-term policies in line with the UN's International Drinking Water Supply and Sanitation Decade (1981 - 1990) and the main contents of these policies are as follows.

a) Satisfactory provision of a domestic water supply.
b) Shortening of the water transportation time by reducing the necessary transportation distance to less than 500m.
c) Reduction of waterborne diseases by a stable supply of clean water.
d) Prevention of groundwater and surface water pollution.

2-3 Outline of Water Supply Situation

2-3-1 Current Domestic Water Supply Situation

(1) Basic Unit of Water Supply

The water supply volume in Malawi, based on the size of the subject area and the planned supply volume per capita per day, in each type of area is as follows.

Large Urban Centres - Blantyre	135ℓ
Lilongwe	140ℓ
Other Urban Centres	55ℓ
Rural Areas (Gravity Piped Water Supply)	36ℓ
Rural Areas (Borehole and Dugwell)	27ℓ

(2) Water Supply Sources

Surface water, lake water and groundwater are used as supply sources. The water supply in urban centres mainly uses surface water while the drinking water in rural areas is provided by either the gravity piped water supply system using surface water or boreholes or dugwells using groundwater.

In the case of the surface water supply, river water is generally stored in dams and then distributed through pipes. Although most surface water is classified as being soft, presenting no problems in its use as domestic water, water originating from small rivers sometimes has a high rate of suspended solids. The development of water source areas by means of introducing forest conservation and other measures is, therefore, in progress in these areas.

Aquifers containing groundwater are mostly found in either the weathered bedrock or sediment layers. Groundwater extracted from parts of the sediment zone along the Shire River shows a relatively high dissolution of iron and sulphide, etc. and presents some problems. Since groundwater is generally

extracted from either boreholes or dugwells using a manual pump, no special water purification measures are employed.

(3) Current Conditions and Problems of Water Supply Facilities

In urban areas, particularly such large urban centres as Blantyre and Lilongwe, the water service ratio is nearly 100% and water supply plans are being implemented with the construction of new dams and other facilities in anticipation of a population increase in the future.

Water supply using the gravity piped system is employed in 47 rural areas (approximately 1 million beneficiaries) and consturction work is currently in progress in 9 other areas.

With regard to the utilization of ground water, 5,100 boreholes with hand pumps and 3,200 dugwells are said to exist, serving some 1.7 million rural inhabitants. Some 30 - 50% of these are, however, currently out of operation due to structural faults of the wells and the deterioration and breakdown of the hand pumps, resulting in a real water supply ratio to rural inhabitants of around 33%.

Acoordingly, most rural inhabitants are obliged to use unsanitary water from dugwells or rivers. In addition, they are forced to work hard to transport water from distant water sources during the dry season, spending a lot of time in non-productive labour and possibly resulting in the spread of waterborne diseases.

The low water supply ratio to rural inhabitants described above is the result of financial constraints on both the construction of new boreholes and dugwells and their maintenance.

(4) Water Supply Population

The water supply situation in Malawi's urban and rural areas is currently as shown in Table 2-10.

Table 2-10 Current Water Supply Situation (1985)

Area	Service Population (Persons)			Water Supply Volume (m^3/day)	Total Population
Urban	Blantyre	360,000	800,000	93,000	960,000
	Lilongwe	140,000			
	Other 54 Urban Centres	300,000			
*Rural	Boreholes with Hand Pumps	1,290,000	2,870,000	45,000	6,100,000
	Dugwells	400,000			
	Boreholes with Moter Pumps	170,000			
	Gravity Piped Water Supply	1,010,000			
Total			3,670,000	138,000	7,060,000

* As 30-50% of the total number of boreholes and dugwells are out of operation, the real service ratio is around 33%.
Source: National Water Resources Master Plan, 1986, Department of Water /UNDP

2-3-2 Current Organization of Water Supply Administration

(1) Water Supply Administration

The water supply administration is divided into urban water supply and rural water supply.

The Water Boards of each individual city are responsible for the water supply in the case of large urban centres, (i.e. Blantyre and Lilongwe). These Water Boards are similar to a

public corporation and manage the water service in accordance with the policies of the Office of the President and Cabinet (OPC). The Department of Water of the Ministry of Works and Supplies is responsible for the water supply in the other 54 urban centres in Malawi.

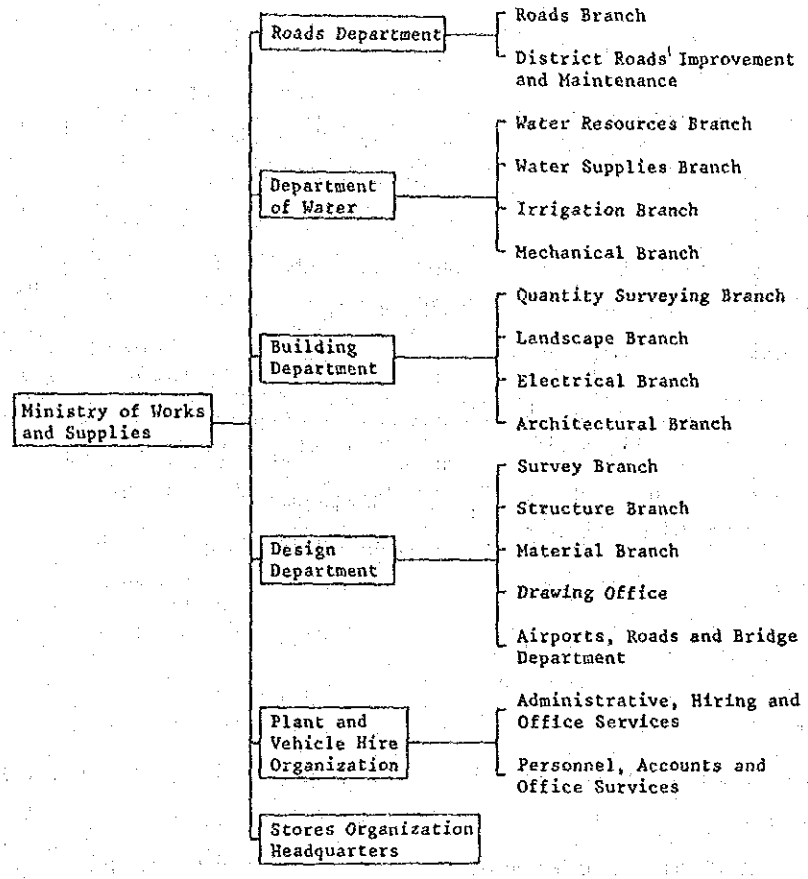
In regard to rural areas, while the District Development Committee (DDC) is responsible for operation and management, the Department of Water is responsible for the initial construction work and the maintenance of the facilities. A request for the development of a new water source can be made to the DDC by the Agricultural Development Division (ADD) of the area concerned. This ADD is a local organization of the Ministry of Agriculture.

The Chairman of the DDC is appointed by the OPC and the committee members consist of the traditional authorities and those appointed by various ministries to be responsible for the relevant local affairs.

When large scale groundwater development is envisaged, as in the case of this Project, the project is prepared by the Department of Water. Following examination and approval of the project by the Economic Planning and Development Division (EP & DD) of the OPC, the Department of Water is then given the responsibility for the construction work and maintenance and the project is given the status of a national project.

The organization of the Ministry of Works and Supplies is outlined in Fig. 2-3.

Fig. 2-3 Organization Chart of Ministry of Works and Supplies

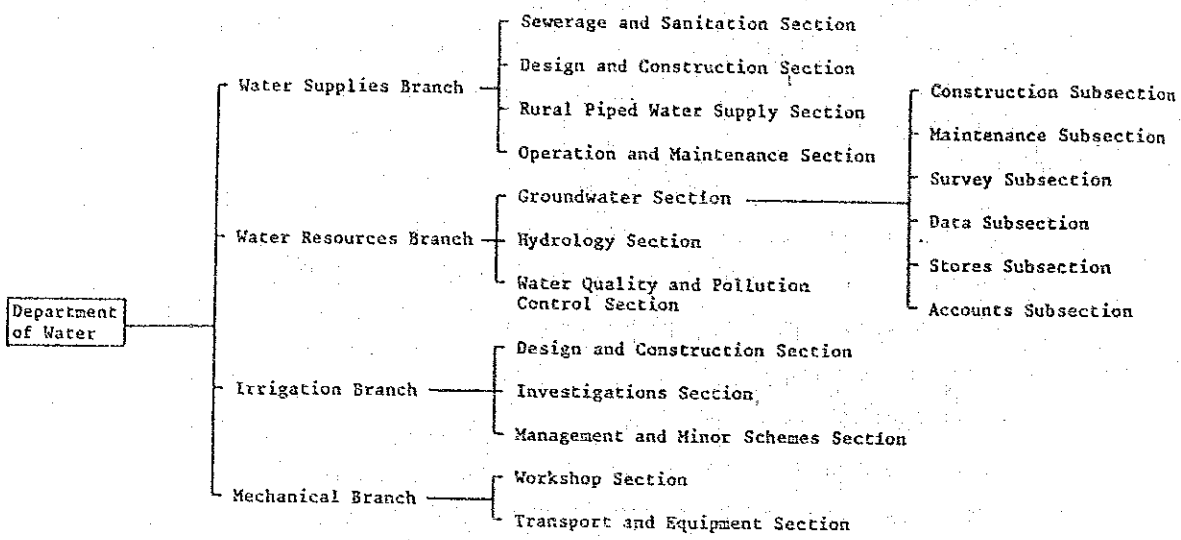


(2) Department of Water, Ministry of Works and Supplies

While the water supply in rural areas was originally under the jurisdiction of the Geological Survey Department of the Ministry of Agriculture and Natural Resources and the Ministry of Community Development and Social Welfare, all related works were integrated to the Department of Lands, Valuation and Water of the latter Ministry in 1979. Since 1984, however, the Department of Water of the Ministry of Works and Supplies has been acting as the responsible authority for the water supply service.

This Project is being handled by the Groundwater Section, Water Resouces Branch, of the Department of Water and Fig. 2-4 shows the organization of the Department.

Fig. 2-4 Organization Chart of Department of Water



The main business of the Ground water Section is as follows.

- o Borehole Development
- o Dugwell Development
- o Borehole and Dugwell Maintenance
- o Technical Work, including Groundwater Assessment and Consulting

1) Groundwater Development Staff

The Groundwater Section currently has 8 hydrogelogists at its core and has 6 subsections, i.e. Construction Subsection, Maintenance Subsection, Survey Subsection, Data Subsection, Stores Subsection and Accounts Subsection.

The Construction Subsection, which is responsible for drilling work, consists of 1 drilling superintendent, 1 senior driller and 8 drillers, operating 13 construction teams and 1 installation team. In principle, the

construction teams and the installation team have 7 and 4 members respectively.

The main work of the Maintenance Subsection is pump repair. The Subsection has a total of 27 well maintenance enginerrs (ranging from senior engineers to assistants), operating 19 well maintenance teams generally consisting of 6 members each. Those well constructed under national groundwater supply projects are jointly managed by assistant maintenance engineers and rural inhabitants with 1 assistant engineer being responsible for 100 boreholes and dugwells. 8 assistant engineers have already been assigned to this type of work for those boreholes and dugwells constructed under the Livulezi, Lilongwe NE and Dowa West Projects.

As mentioned above, rural inhabitants are expected to be responsible for the boreholes and dugwells of national projects. In view of the difficulties in purchasing spare parts due to the lack of foreign currencies, the selection of those pumps which seldom break down and which are easy to repair is of extreme importance for the maintenance of these boreholes.

29 additional engineers and clerical staff are assigned to the Survey Subsection, Stores and Accounts Subsection.

2) Conditions of Drilling Rigs

The Department of Water has 12 drilling rigs, i.e. 11 percussion type and 1 rotary type. The rotary type drilling rigs is on loan via the Ministry of Agriculture through foreign assistance. However, as the Department lacks staff capable of operating this rig, it is rented out to a private driller. Accordingly, the construction work directly carried out by the Department of Water uses

only the 11 percussion type drilling rigs. In view of the poor efficiency of these rigs against hard bedrock and the repeated breakdowns due to deterioriation, the Department of Water is now planning to improve the work efficiency by the introduction of a highly efficient, rotary - air hammer type drilling rigs (including the transfer of technologies).

Details of the borehole drilling rigs owned by the Department of Water are given in Table 2-11.

3) Previous Construction Work

While borehole construction work is, in principle, directly conducted by the Department of Water, private drillers have often been commissioned to do the work in view of the poor efficiency of the Department's drilling rigs, as described earlier.
The Department of Water has directly carried out the following borehole construction work since 1983.

1983/84	84 sites
1984/85	70 sites
1985/86	150 sites
1986/87	102 sites (upto December, 1986)

Table 2-11 List of Borehole Drilling Rigs

No.	Name of Drilling Rig	Manufacturing Year	Type	Drilling Ability	Present Work Efficiency*	Utilizing Conditions as of August, 1987
1	Ruston Bucyrus 22RK (U.K.)	1967	Percussion·Trailer Type	106 m	45m/week	Working in the Central Region
2	- do -	1967	- do -	- do -	- do -	Working in Lilongwe N.E. Project Site
3	- do -	1967	- do -	- do -	- do -	- do -
4	- do -	1967	- do -	- do -	- do -	- do -
5	- do -	1967	- do -	- do -	- do -	Working in School Premises
6	- do -	1971	- do -	- do -	- do -	Working in the Southern Region
7	- do -	1980	Truck-mounted Percussion Type	- do -	- do -	Working in the Northern Region
8	AXBE 450/120 (Sweden)	1981	Percussion·Trailer Type	50 m	45m/1.5 week	Working in Lilongwe N.E. Project Site
9	- do - (U.K.)	1981	- do -	- do -	- do -	- do -
10	DANDO 200 (U.K.)	1980	- do -	- do -	- do -	Working in fishing jobs
11	Ruston Bucyrus 22RK (U.K.)	1985	- do -	106 m	45m/week	Working in Lilongwe N.E. Project Site
12	HYDREQ (U.K.)	1980	Truck-mounted Rotary Type	400 m	100m/2-3days	Working in Mozambique Refugee Camp of UNHCR (Drilling work is executed by a private drilling company)

Remark: Ruston Bucyrus 22RK made in 1965 has been scrapped due to its deterioration though it was used recently

*: Drilling period for soil and high weathered rock

Source: Department of Water

2-3-3 Current Conditions of Groundwater Use and Development Projects

Water supply systems to rural inhabitants are classified into the gravity piped system using surface water and the borehole and dugwell system using groundwater. The National Water Resources Master Plan 1986, prepared by the Department of Water and the UNDP, gives the following service population for each type of water resource and the expected number of boreholes and dugwells required in 2000.

	Present Service Population	Estimated Service Population in 2000
Gravity Piped System	1.01 million	2.16 million
Borehole and Dugwell System	1.76 million (Actual number is about 1.01 million due to the facility breakdown ratio of 30-50%.)	6.86 million

Table 2-12 Estimated Number of Boreholes and Dugwells and Service Population

	1985	1990	1995	2000	2005
Boreholes (No. in Operation)	5,100 (3,060)	6,600 (4,540)	8,600 (7,300)	10,600 (10,360)	12,600 (12,600)
Service Population by Boreholes (Thousands)	770	1,140	1,830	2,590	3,150
Dugwells (No. in Operation)	3,200 (1,920)	5,200 (4,040)	6,700 (5,840)	8,200 (7,860)	9,700 (9,700)
Service Population by Dugwells (Thousands)	240	500	730	980	1,210
Total Service Population (Thousands)	1,010	1,640	2,560	3,570	4,360

Source: National Water Resources Master Plan, 1986 by Department of Water /UNDP

As shown in Table 2-12, the population requiring a domestic water supply from boreholes in 2000 is estimated to be 6.86 million, showing the large demand for groundwater development. In comparison, the target service population by groundwater in the same year is approximately 3.57 million, far below a satisfactory level. Groundwater development in Malawi will, therefore, remain an important task in the future.

In view of the present and estimated use of groundwater given above, the list of national groundwater supply projects compiled by the Department of Water and respective project are given in Table 2-13 and Fig. 2-5, showing the projects implemented or to be implemented in 1981 onwards.

2-3-4 Foreign Assistance

It is difficult for the Government of the Republic of Malawi to independently carry out national projects intending to secure a water supply for rural inhabitants in view of its financial situation. Accordingly, all project have been implemented with the assistance of foreign governments or international organizations and all project areas have been coordinated in order to prevent overlapping.

With regard to the gravity piped water supply, assistance has been extended by Denmark, Canada, the US, Japan, UNICEF and CSC (Christian Services Committee) since 1968 and water supply services are now available in a total of 47 areas. The Government of the Republic of Malawi has received grants totalling 6 million dollars in the 5 years between 1981 and 1985 to carry out the relevant projects.

Denmark, UNICEF and others have also extended grants for groundwater development and the Government of the Republic of Malawi has requested further assistance from West Germany and Japan. Malawi has also received loans from the IDA, IFAD and EEC with the Ministry of Agriculture being the recipient.

As the subject areas of the groundwater supply projects implemented with the assistance of foreign governments or international organizations overlap with the development areas of the NRDP, these areas should be given high priority in the development of Malawi's eceonomy.

Table 2-13 National Groudwater Supply Projects by Department of Water

No.	Project Area	Period	Source of Fund	Amount of Fund (K)	Executing Organization	Contractor	Target Population	Progress				Type of Pump
								Borehole		Dugwell		
								New	Rehabilitation	New	Rehabilitation	
1	Dowa West	1982-1986	IFAD (Loan)	530,000	Ministry of Agriculture	C.C.* Water Dept.	70,000	115	29	136	54	MALDEV
2	Lilongwe N.E.	1984-(1988) under Construction	IDA (Loan)	1,066,000	- do -	Water Dept.	91,000	220/442	70	54/185	17/150	MALDEV/INDIAN MARK II
3	Livulezi	1981-1982	DANIDA/UNICEF (Grant)	358,000	Water Dept.	- do -	43,000	134	5	60	0	MALDEV/AFRIDEV/NIRA/ INDIAN MARK II
4	Karonga	1986-(1989) under Construction	DANIDA(Grant)	565,000	- do -	--	50,000	--	--	--	--	Proposed AFRIDEV
5	Emcisweni	1986-(1987) under Construction	UNICEF(Grant)	286,000	- do -	C.C. Water Dept.	22,500	40	0	0	0	MALDEV/INDIAN MARK II
6	Dadza Hills	1987- under Construction	IDA (Loan)	650,000	Ministry of Agriculture	C.C.	71,000	0/120	0/47	0/120	0/100	Proposed AFRIDEV
7	N. Kawinga	being Requested	Japan (Grant)	--	Water Dept.	--	--	--	--	--	--	--
8	Ulongwe	- do -	West Germany	--	--	--	--	--	--	--	--	--
9	Kasungu/Mchinji Dowa East	1987- under Construction	IFAD (Loan)	820,000	Ministry of Agriculture	C.C.	101,000	0	0/243	0	0/250	Proposed AFRIDEV
10	Salima-Bwanje	1987- under Construction	EEC (Loan)	1,600,000	- do -	- do -	131,000	0/97	0/275	0	0/100	Proposed AFRIDEV
11	Salima-Nkhotakota	1983- under Construction	EEC (Loan)	?	- do -	Water Dept.	?	0	0	200/(?)	0	--
12	Zomba West	being Requested	--	--	--	--	--	--	--	--	--	--
13	Ngabu	- do -	IDA/UNICEF	--	--	--	--	--	--	--	--	--
14	Balaka	- do -	West Germany	--	--	--	--	--	--	--	--	--
15	Namuwera	- do -	AfDB	--	--	--	--	--	--	--	--	--

* C.C. : Construction Company

Source: Department of Water

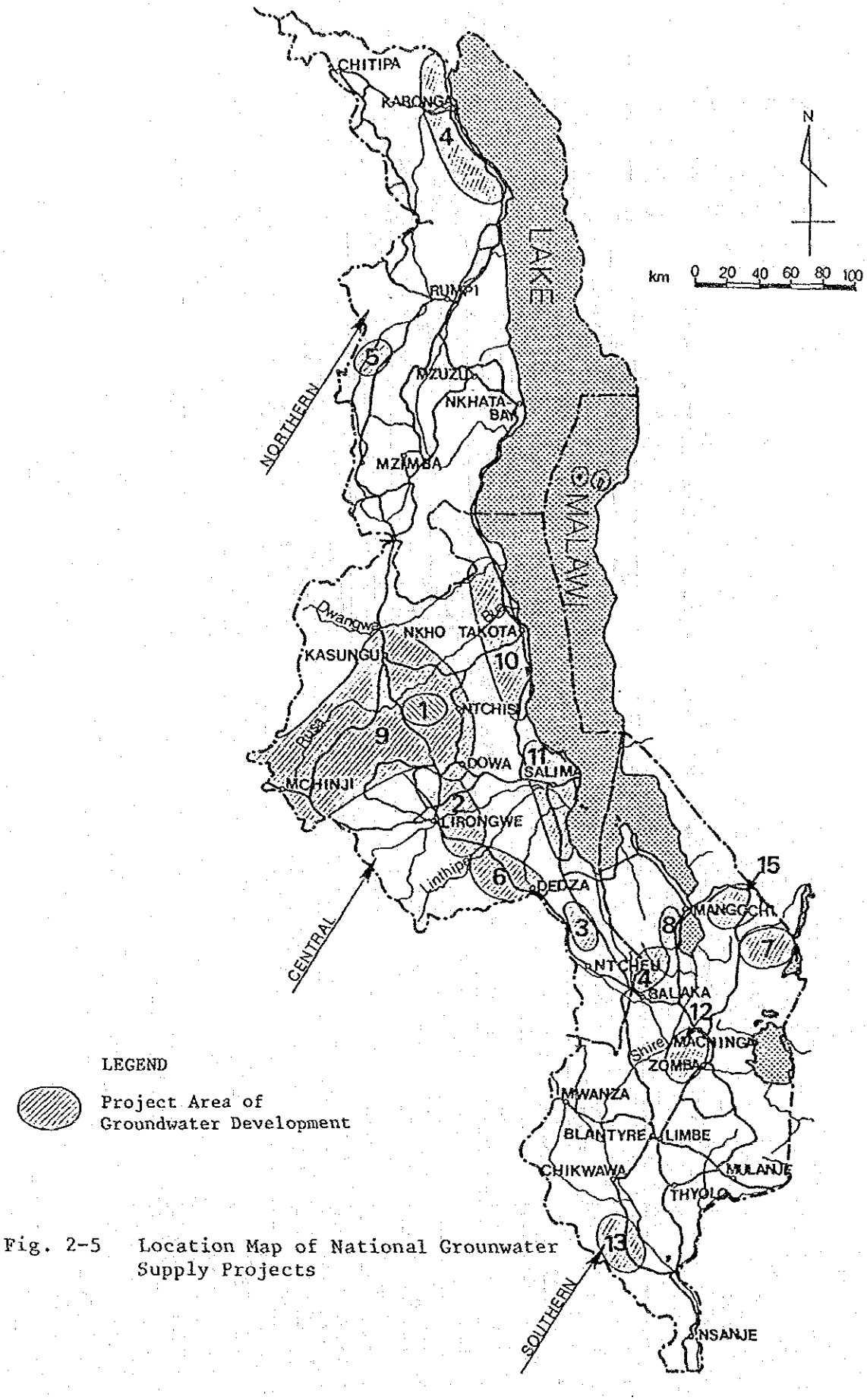


Fig. 2-5 Location Map of National Grounwater Supply Projects

2-4 Request to Japan

2-4-1 Objectives

The Government of the Republic of Malawi considers the promotion of agriculture to be the highest priority target for national development efforts. It is accordingly currently carrying out gravity piped water supply projects and groundwater supply projects throughout the country as part of the infrastructure improvement programme to facilitate agricultural development and the settlement of rural inhabitants. However, the Government recognizes the fact that it will be difficult to achieve the successful completion of these groundwater supply projects on the basis of the country's own efforts in view of Malawi's financial problems, the frequent breakdowns of the government-owned drilling rigs due to their deterioration, the poor efficiency of these percussion type drilling rigs and other reasons.

Under these circumstances, the Government has prepared the groundwater supply project for North Kawinga, which is one of those areas growing such cash crops as tobacco and which faces a shortage of water but which is given high priority in terms of Malawi's economic development, and has made a request to the Government of Japan for the provision of grant aid for the necessary machines, equipment and materials (including the transfer of technologies) for the well construction work in view of the Project's successful completion.

2-4-2 Contents of the Request

The following are the contents of the Malawi Government's request.

(1) Required Machines, Equipment and Materials

1)	Truck mounted drilling rig (rotary - air hammer type)	2 units
2)	Truck mounted test pumping equipment	2 units
3)	Truck mounted borehole servicing machine	1 unit
4)	Mobile workshop truck	1 unit
5)	Geophysical survey equipment	2 sets
6)	Borehole logging equipment	2 sets
7)	Transportation equipment	
	- 4WD station wagon	2 nos
	- 4WD pick up	2 nos
	- 8 ton cargo truck with crane	2 nos
	- 4 cu.m water tank lorry	1 no
	- Motorcycle	4 nos
8)	Communication equipment	1 set
9)	Casing and screen	for 280 B/H
10)	Hand pump	300 sets
11)	Spare parts	1 lot

(2) Rehabilitation of existing boreholes 24 B/H

(3) Construction of new borehole 236 B/H

Specifications of Borehole

1) Depth of borehole : 60 meters on average

2) Diameter of borehole (casing size) : 4 inch as PVC or FRP

3) Pumping unit : Hand pump