ANNEX I

TENTATIVE PROGRAMME

SCHEDULE OF COURSE IMPLEMENTATION (FOR JFY 1996)

DATE (DAY)	SESSION TIME(HRS)	CODE (TOPIC)	CONTENTS	VENUE	INSTRUCTOR/ IN-CHARGE
			Individual departure at own airport		
2-02-97 (Sunday)		-	Arrival. Registration. Free Tour, Cultural Programme	JKIA JKUAT	Organizing Committee
3-02-97 (Monday)	1 0800 - 1000	-	Introduction to course	EMB032	Course Leaders
	2 1030 - 1230	-	Opening ceremony	JKUAT	Vice-Chancellor
	3 1345 - 1515	-	Administrative details	JKUAT	Chairman, C.E.
	4 1530 - 1700	-	Medical Details	JKUAT	Chief Medical Officer
4-02-97 (Tuesday)	1 0800 - 1000	WPA101 (C)	Water and health	EMB032	
	2 1030 - 1230	WPA102 (C)	Water quality in Eastern Africa	EMB032	
	3 1345 - 1515	WPA101 (A)	Water budget & master plan	EMB032	
	4 1530 - 1700	WPA101 (A)	Water budget & master plan	EMB032	
5-02-97 (Wednesday)	1 0800 - 1000	WPA102 (B)	Influence of topography & geology on water environments in E. Africa	EMB032	
	2 1030 - 1230	WPA103 (A)	Point and non-point water pollution	EMB032	
	3 1345 - 1515	WPA101 (B)	Engineering challenges in water supply for marginal lands	AVR	
	4 1530 - 1700	WPA101 (B)	Engineering challenges in water supply for marginal lands	AVR	

DATE (DAY)	SESSION TIME(HRS)	CODE (TOPIC)	CONTENTS	VENUE	INSTRUCTOR/ IN-CHARGE
6-02-97 (Thursday)	1 0800 - 1000	WPA104 (B)	Minor but significant chemical elements in water	EMB032	
	2 1030 - 1230	WPA104 (C)	Biological examination of water (BOD, DO, Coliform)	EMB032	
	3 1345 - 1515	WPA102 (A)	African environments	EMB032	
	4 1530 - 1700	WPA102 (A)	African environments	EMB032	
7-02-97 (Friday)	1 0800 - 1000	WPA110 (B)	JKUAT Sanitary Laboratory	EMB035	
	2 1030 - 1230	WPA110 (B)	JKUAT Sanitary Laboratory	EMB035	
	3 1345 - 1515	WPA103 (B)	Types and characteristics of water pollutants	EMB032	
	4 1530 - 1700	WPA103 (B)	Types and characteristics of water pollutants	EMB032	
8-02-97 (Saturday)	Free	-	Individual programme	-	-
9-02-97 (Sunday)	Free	-	Individual programme	-	-
10-02-97 (Monday)	1 0800 - 1000	WPA110 (A)	Diversion of foul water in rainwater harvesting	FIELD	
	2 1030 - 1230	WPA110 (A)	Diversion of foul water in rainwater harvesting	FIELD	
	3 1345 - 1515	WPA110 (D)	JKUAT water purification plant	SITE	
	4 1530 - 1700	WPA110 (D)	JKUAT water purification plant	SITE	
11-02-97 (Tuesday)	1 0800 - 1000	WPA106 (A)	Water quality sampling points and network	EMB032	
	2 1030 - 1230	WPA106 (B)	Instrumentation	EMB032	
	3 1345 - 1515	WPA103 (C)	Modern methods for detection of water pollution	EMB032	
	4 1530 - 1700	WPA103 (C)	Modern methods for detection of water pollution	EMB032	

DATE (DAY)	SESSION TIME(HRS)	CODE (TOPIC)	CONTENTS	VENUE	INSTRUCTOR/ IN-CHARGE
12-02-97 (Wednesday)	1 0800 - 1000	WPA105 (A)	Water treatment	EMB032	
	2 1030 - 1230	WPA105 (A)	Water treatment	EMB032	
	3 1345 - 1515	WPA104 (A)	Physical and chemical analysis	EMB032	
	4 1530 - 1700	WPA104 (A)	Physical and chemical analysis	EMB032	
13-02-97 (Thursday)	1 0800 - 1000	WPA107 (A)	The diffusion equation	EMB032	
	2 1030 - 1230	WPA107 (B)	Longitudinal and lateral diffusion coefficients	EMB032	
	3 1345 - 1515	WPA106 (C)	Water quality monitoring models	EMB032	
	4 1530 - 1700	WPA111 (A)	Basic tests in water treatment	EMB035	
14-02-97 (Friday)	1 0800 - 1000	WPA109 (A)	Control of water pollution by aquatic plants	EMB032	
	2 1030 - 1230	WPA109 (B)	Use of local materials in water purification	EMB032	
	3 1345 - 1515	WPA107 (A)	The diffusion equation	EMB032	
	4 1530 - 1700	WPA111 (A)	Basic tests in water treatment	EMB035	
15-02-97 (Saturday)	Free	-	Individual programme	-	-
16-02-97 (Sunday)	Free	-	Individual programme	-	-
17-02-97 (Monday)	1 0800 - 1000	WPA111 (A)	Basic tests in water treatment	EMB035	
	2 1030 - 1230	WPA111 (A)	Basic tests in water treatment	EMB035	
	3 1345 - 1515	WPA111 (D)	Computation and reporting of results	EMB036	
	4 1530 - 1700	WPA111 (D)	Computation and reporting of results	EMB036	

DATE (DAY)	SESSION TIME	CODE (TOPIC)	CONTENTS	VENUE	INSTRUCTOR/ IN-CHARGE
18-02-97 (Tuesday)	1 0800 - 1000	WPA110 (E)	JKUAT Nature Channel	SITE	
	2 1030 - 1230	WPA110 (E)	JKUAT Nature Channel	SITE	
	3 1345 - 1515	WPA110 (C)	Measurements at a river gauging station	SITE	
	4 1530 - 1700	WPA110 (C)	Measurements at a river gauging station	SITE	
19-02-97 (Wednesday)	1 0800 - 1000	WPA111 (D)	Computation and reporting of results	EMB036	
	2 1030 - 1230	WPA111 (D)	Computation and reporting of results	EMB036	
	3 1345 - 1515	WPA111 (C)	Sampling techniques for tap, rain, well and river water	EMB032	
	4 1530 - 1700	WPA111 (B)	Chemical and biological tests	EMB035	
20-02-97 (Thursday)	1 0800 - 1000	WPA107 (A)	The diffusion equation	EMB032	
	2 1030 - 1230	WPA105 (B & C)	Water treatment for specific contaminants/rehabilitation	EMB032	
	3 1345 - 1515	WPA111 (C)	Sampling techniques for tap, rain, well and river water	EMB032	
	4 1530 - 1700	WPA111 (B)	Chemical and biological tests	EMB035	
21-02-97 (Friday)	1 0800 - 1000	WPA112 (A)	Field tour to Kitui and Machakos Districts (Kenya)	SITE	
	2 1030 - 1230	WPA112 (A)	Field tour to Kitui and Machakos Districts (Kenya)	SITE	
	3 1345 - 1515	WPA112 (A)	Field tour to Kitui and Machakos Districts (Kenya)	SITE	
	4 1530 - 1700	WPA112 (A)	Field tour to Kitui and Machakos Districts (Kenya)	SITE	
22-02-97 (Saturday)	Free	-	Individual schedule	-	

DATE (DAY)	SESSION TIME	CODE (TOPIC)	CONTENTS	VENUE	INSTRUCTOR/ IN-CHARGE
23-02-97 (Sunday)	Free	-	Individual schedule	-	
24-02-97 (Monday)	1 0800 - 1000	WPA107 (C)	Inland and coastal waters	EMB035	
	2 1030 - 1230	WPA107 (D)	Numerical and physical modelling	EMB035	
	3 1345 - 1515	WPA108 (A)	Mechanics of sediment production, transport and deposition	AVR	
	4 1530 - 1700	WPA108 (A)	Mechanics of sediment production, transport and deposition	AVR	
25-02-97 (Tuesday)	1 0800 - 1000	WPA111 (B)	Chemical and biological tests	EMB035	
	2 1030 - 1230	WPA111 (B)	Chemical and biological tests	EMB035	
	3 1345 - 1515	WPA108 (B)	Sediment yield and transport models	AVR	
	4 1530 - 1700	WPA108 (B)	Sediment yield and transport models	AVR	
26-02-97 (Wednesday)	1 0800 - 1000	WPA108 (C)	Transport of pollutants by mixed size sediments	EMB032	
	2 1030 - 1230	WPA108 (C)	Transport of pollutants by mixed size sediments	EMB032	
	3 1345 - 1515	WPA108 (D)	Models for evaluation of sediment yield by vegetation	EMB032	
	4 1530 - 1700	WPA108 (D)	Models for evaluation of sediment yield by vegetation	EMB032	
27-02-97 (Thursday)	1 0800 - 1000	WPA105 (B)	Water treatment for specific contaminants	EMB032	
	2 1030 - 1230	WPA105 (C)	Specific pipeline rehabilitation techniques	EMB032	
	3 1345 - 1515	WPA113 (A)	Country reports	AVR	
	4 1530 - 1700	WPA113 (A)	Country reports	AVR	

DATE (DAY)	SESSION TIME	CODE (TOPIC)	CONTENTS	VENUE	INSTRUCTOR/ IN-CHARGE
28-02-97 (Friday)	1 0800 - 1000	WPA112 (C)	Field Visit to Dandora waste treatment plants	SITE	
	2 1030 - 1230	WPA112 (C)	Field Visit to Thika Town's waste treatment plant	SITE	
	3 1345 - 1515	WPA112 (B)	Field visit to Ngethu water treatment plant	SITE	
	4 1530 - 1700	WPA112 (B)	Field visit to Ngethu water treatment plant	SITE	
01-03-97 (Saturday)	Free	-	Individual schedule	-	
02-03-97 (Sunday)	Free	-	Individual schedule	-	
03-03-97 (Monday)	1 0800 - 1000	WPA113 (A)	Country reports	AVR	
	2 1030 - 1230	WPA113 (A)	Country reports	AVR	
	3 1345 - 1515	WPA113 (B)	Present state of water environments in Kenya	AVR	
	4 1530 - 1700	WPA113 (B)	Present state of water environments in Kenya	AVR	
04-03-97 (Tuesday)	1 - 4 0800 - 1700	WPA113 (A)	Country reports	AVR	
05-03-97 (Wednesday)	1 - 4 0800 - 1700	WPA112 (D)	Field tour to Nakuru Town (Rift Valley, Kenya)	FIELD	
06-03-97 (Thursday)	1 - 4 0800 - 1700	WPA112 (E)	Field tour:Pan African Paper Mills (Webuye, W. Kenya)	FIELD	
07-03-97 (Friday)	1 - 4 0800 - 1700	WPA112 (F)	Field Visit to sugar cane factories and Lake Victoria in Kisumu, Western Kenya	FIELD	
08-03-97 (Saturday)	Free	-	Individual schedule	-	
09-03-97 (Sunday)	Free	-	Individual schedule	-	

DATE (DAY)	SESSION TIME	CODE (TOPIC)	CONTENTS	VENUE	INSTRUCTOR/ IN-CHARGE
10-03-97 (Monday)	1 - 4 0800 - 1700	-	Re-cap of training course 1 Course report	EMB 035	Organizers
11-03-97 (Tuesday)	1000 -1200 1400 -1600	-	Re-cap of training course 2 Course report	EMB 035	Organizers
12-03-97 (Wednesday)	1000 -1200 1400 -1600	WPA113 (C)	Conference, Open discussion Course report	AVR	Organizers
13-03-97 (Thursday)	1000 -1200 1400 -1600	-	Course appraisal	AVR	Organizers
14-03-97 (Friday)	1000 -1200	-	Closing Ceremony	JKUAT	JKUAT Vice - Chancellor

LEGEND: AVR - Audio Visual Room; EMB - Engineering Main Building; JKIA - Jomo Kenyatta International Airport; JKUAT - Jomo Kenyatta University of Agriculture & Technology.

7. 消耗品内訳

研修諸費：消耗品購入費 US$24、000

消耗品の内訳詳細

試薬：各種の採取汚水計測と処理に使用する薬品類の消耗品

フタル酸塩、中性酸塩、塩化ナトリウム、水酸化カリウム、塩化銀、二酸化炭素吸収剤、硫酸銅溶液、過マンガン酸カリウム、酸化コバルト、塩酸、硝酸、ペルオキソニ流酸、四塩化炭素、イソオクタン、ヘキサデカ、ベンゼン、精製カオリン、シアン化水素、水酸化ナトリウム、塩化スズ、シアン、アンモニア、炭酸水素ナトリウム、炭酸ナトリウム溶液硫酸、ドデシルベンゼンスルホン酸、酸化アルミニュウム、りん酸塩、アンモニウム塩、マグネシウム塩、カルシウム塩、硫酸マンガン、アルカリ性ヨウ化カリウム、水酸化マンガン、グルコース、Ｌ－グルタミン酸、チオ硫酸ナトリウム、硫酸アンモニウムニウム鉄、メチレンブルー溶液、酒石酸ナトリウムカリウム、流動パラフィン、二酸化マンガン、イオン、トルエン、クロロホルム、エチルエーテル、ブチル等、交換水液体膜電極：NO,C10,C1,BF,Ca,K,NH,F,Br,I,CN,SCN,S, Ag,Cd ，各種カラム、消耗容器、特殊電池類、フィルター類、記録用紙、採取容器、ろ過紙、ろ液等

＊＊＊試薬購入が高額になる理由＊＊＊

１，各種試薬（実験・実習・試験）に使用する純精製薬品は現地購入が可能であるが、現地業者はこういった純精製薬品をイギリスから輸入している為（航空輸送費、関税、引き取り料がかさみ）高額となっている。現地生産されている薬品は、質が悪く、劣化した薬品が少なくない。この為、各技術機関や大学は独自の輸入ルートから純精製薬品を調達している。

２，試薬の購入にあたっては、最低限購入量が定められているために、ケース毎、ボトル毎に購入しなければならない為、基本的には不経済である

３，試薬は開封後規定日数内で使わなければならない多く、ボトル開封後の薬品で翌年に回す事ができる物は多くない。

ガラス容器：各種の採取汚水計測と処理に使用するガラス容器類の消耗品
特殊ガラス容器以外については、粗雑品であるが現地生産をしている。ガラス製コンデンサー等は現地業者を通じてイギリスより購入。

耐薬品性各種チューブ：
シリコン・チューブ（600rpm: 最大寿命時間７０時間）
バイトン・チューブ（600rpm: 最大寿命時間３０時間）
タイゴン・チューブ（600rpm: 最大寿命時間５０時間）
Ｃ－ﾌﾚｯｸｽ･チューブ（600rpm: 最大寿命時間１５０時間）
各種とも内径0.8mm,1.7mm,3.2mm,4.9mm,6.5mm 8.0mm,9.0mm を調達（現地生産をしていないので現地業者を通じてイギリスより購入）

原子吸光分析機用単元素ランプ：
銀、アルミニュウム、ひ素、ホウ素、コバルト、クロム、銅、鉄、ゲルマニュウム、水銀、リチウム、マグネシウム、マンガン、ナトリウム、ニッケル鉛、けい素、スズ、亜鉛

（供与機材としてすでに供与されているが、ケニアの電気供給事情が悪く、電圧の高低差が著しい為、単元素ランプの寿命が非常に短い。現地生産をしておらず、現地業者を通じてイギリスより購入。）

その他：

研修員用耐薬品性白衣・手袋、湿地帯でのサンプルリングに必要なゴム長、各種文具品（フロッピーデイスク等）

REQUEST OF JAPANESE EXPERT (SHORT TERM) FOR
3RD COUNTRY GROUP TRAINING
"WATER POLLUTION AND ITS ANALYSYS" COURSE

FACULTY: ENGINEERING DEPERTMENT: CIVIL ENGINEERING

1. AREA/FIELD IN WHICH EXPERT IS REQUIRED	Environmental Engineering in water and sanitary
2. QUALIFICATION REQUIRED	At least holding Master's Degree, 5 years of lab testing experience in University and have a good communication skills in spoken English.

3. DUTY REQUIREDFOR EXPERT

Assist lab-courses of followings :
A. Diversion of foul water in rain harvesting,
B. Basic measurement at a river gauging station,
C. Element of water treatment plant,
D. Sanitary and waste water laboratory,
E. Water quality monitoring system and,
F. Basic tests in water analysis and sampling techniques.

Expert will also be required assisting to conduct seminar during the course.

4. NAME AND DESIGNATION OF COUNTERPART FOR EXPERT REQUESTED

Mr. R. M. Kalama (Technician), Mr. K. Nga'nga (Technician)
Mrs. D. R. Kilimi (Technician)

5. TIME OF DESPATCH REQUIRED	February 1997.
6. DURATION OF STAY REQUIRED	1 (One) month

7. EQUIPMENT, MATERIALS, BOOKS, ETC AVAILABLE FOR EXPERT

OHP, Slide Proector, Several equipment for Environmental Engineering.

8. BENEFIT/RESULT EXPECTED, ETC AVAILABLE FOR EXPERT

Department expect a first operating 3rd country group training course with smooth runing. It is very important to have on-site advise to conduct the first course.

9. REMARKS

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8. 日本人研修講師(短期専門家)業務内容案

TENTATIVE SCHEDULE OF WORK REQUIRED FOR EXPERT

WEEK	PROPOSED ASSIGNMENTS
1 - 4 week	Paying a courtesy call to JICA Kenya Office. Visit to JKUAT, introduction to members of staff in the department. Assist and conduct 3rd country group training course. Discussion of the future plan. Report to JKUAT and JICA Kenya Office.

REQUEST OF JAPANESE EXPERT (SHORT TERM) FOR
3RD COUNTRY GROUP TRAINING
"WATER POLLUTION AND ITS ANALYSYS" COURSE

FACULTY: ENGINEERING DEPERTMENT: CIVIL ENGINEERING

1. AREA/FIELD IN WHICH EXPERT IS REQUIRED	Environmental Engineering in water and sanitary
2. QUALIFICATION REQUIRED	Ph.D Level or equvalent,10 years of teaching experience in University and have a good command of written and spoken English.

3. DUTY REQUIREDFOR EXPERT

Assist course lecturering of following :
A.Water sources and their interaction with human environment,
B.Origin and detection of water pollution,
C.Evaluation techniques in water pollution,
D.Measure to prevent water pollution,
E.Water quality monitoring system and,
F.Diffusion and dispersion of pollutants in natural water.

Expert will also be required assisting to conduct seminar during the course.

4. NAME AND DESIGNATION OF COUNTERPART FOR EXPERT REQUESTED

Dr.K.S.Makhanu (Lecturer), Dr.G.M.Thumbi (Lecturer), Mr.A.O.Mayabi (Lecturer)

5. TIME OF DESPATCH REQUIRED	February 1997.
6. DURATION OF STAY REQUIRED	1 (One) month

7. EQUIPMENT, MATERIALS, BOOKS, ETC AVAILABLE FOR EXPERT

OHP, Slide Proector, Several equipment for Environmental Engineering.

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9. REMARKS

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近隣諸国　カントリー・レポート

RWANDA COUNTRY REPORT

1. Introduction:

Departments dealing with water in Rwanda, have always been facing many problems.

- Financial problems
- A very limited number of qualified technicians.
- And lack of apropriate equipment due to lack of funds.
- Transferring of these water departments from time to time, from one Ministry to another, thus causing the departments to have new leaders all the time and this handicaps the good running of work.

2. Hydrological Situation In Rwanda

(a) Hydrological department was once in the Ministry of Agriculture and was then moved to the Ministry of Public Works. Problems they went with, was not a priority to the new Ministry.

(b) When it was still in the Ministry of Agriculture, the hydrological department had a small laboratory run by a French expart but it was only dealing with Sediment measurements; and after a short time the laboratory was stopped, for unknown reasons.

3. Hydromet

(a) Hydromet since its installation in Rwanda in 1972, it was somehow independent,not under any Ministry. It was being supervised by the Project Management at Entebbe - Uganda. In 1978 towards the end of the year, it was put under the Ministry of Transport and Communications.

(b) In Kigali Regional Office - we have been provided with sediment discharge equipment by the Project Management. But because we don't have a laboratory, this equipment has never been used.

4. Water Supply Department

(a) The water supply department is an independent organization,having its own status and its own annual financial budget. There is no clear cooperation between this organization with the other departments dealing with water.

(b) As far as laboratories are concerned,this water supply department has many stations all over the country in which water for house hold uses is purified.

5 Type of Data Collected

Rwanda is divided into two main water shades. The Nile and Zaire river water shades. About 80% of the total water in the whole country flows to the Nile basin and the rest of the water 20% flows to the Zaire river basin.

The hydrological department in the Ministry of Public works has height gauging stations all over the country covering the two water shades, and at good number of stations, discharge measurements are done. Annual hydrological publication is prepared and it is given out to the users. Hydromet is only dealing with the water course of the Nile. And the data collected are the gauge heights and discharged measurements. The collected data is sent to Hydrodmet headquarters for analysis.

6. Assistance from International Organizations

As in other fields, water departments demand help from the International Organizations. In this respect, WMO had suggested that all departments dealing with water be grouped in one organization which they called Institute of Hydrometeorological Research. But due to financial problems, this institute might not be formed in the near future.

The purpose of wanting to group together all the water departments, was to put together all energy and knowledge for the work efficiency.

COUNTRY PAPER
WATER QUALITY MONITORING SYSTEM, SUDAN

1.0. General Background

Sudan is the largest country in Africa with a total area of 2.5 million square kilometres. It lies between latitudes 4 - 22 N and longitude 22 - 34 E. The climate is tropical in the South, desert and semi desert in the North.

The River Nile, its tributaries, rainfall and groundwater represent the water resources in the country.

The quality of water available is at times less than desirable standards (WHO, and local). Excessive level of naturally occurring dissolved solids, turbidity nitrate and fluoride are common in some water supplies.

2.0. Water Authorities

There are different agencies that deal with water in Sudan. The Ministry of Irrigation and Water Resources is responsible for use, planning, development and management of the whole country's water resources. The National Urban Water Corporation and The National Rural Water Corporation are responsible for provision and quality monitoring of urban and rural areas drinking water respectively. The National Chemical Laboratory and the Ministry of Health sets the standards for water use, and monitoring the quality of drinking water and its health implications in the whole country.

3.0. Main Sources of Water Supply

Almost all the urban communities which are situated along the River Nile and its tributaries use surface water as the main source of supply. This water is subjected to treatment with different dosage of aluminium sulphate and hydrated lime (during the flood season). This is followed by sedimentation, and filtration using rapid sand filters. Chlorine is then applied for disinfection, pure water is thus pumped to the storage reservoirs from where it is later pumped to the balanced high level tank and finally reaches the distribution system.

In areas along the Nile where there is no treatment plant, water is pumped directly from the Nile through pipes to the consumer taps without treatment.

In rural areas and urban settlements lying far from the River Nile, open dug wells, boreholes and artificial ponds known as Hafirs are commonly used to serve these communities. Water from boreholes or Hafirs is usually not treated, however, slow sand filtration is sometimes carried out for Hafir water.

4.0. Monitoring of Water Quality

The National Urban Water Corporation (NUWC) which is the sole agent responsible for drinking water provision in the urban areas has the Mogren Central Laboratory which is responsible for water quality control in Khartoum water works and supervise and inspect the other branches distributed in the major urban centres in the country.

The central laboratory (Mogren) of the NUWC consists of a bacteriological and chemical laboratories and is operated by eight technicians. The Laboratories are functioning with outdated equipments mostly provided since the early inception days. At each treatment plant samples are always taken from the intake sites, the filter, and tap water on daily basis as a routine test. A weekly examination is usually done for the boreholes and distribution system for bacteriological test. On monthly basis samples are taken from the Nile, tap and borehole water for the purpose of full chemical analysis.

The parameters for this chemical analysis include the pH, turbidity, conductivity, total hardness, total alkalinity, calcium and magnesium, sulphate, chloride, nitrite, ammonia, silica, suspended and dissolved solids. All the results are compared to the National Standards and WHO guidelines. A monthly report is produced and submitted to the Director General of the Urban Water Co-operation.

Water samples from other parts of the country are sometimes collected and analyzed in the National Chemical Laboratories especially when a water quality problem arises.

WATER QUALITY MONITORING IN TANZANIA

1. INTRODUCTION

Geographically, the United Republic of Tanzania is situated in the Eastern part of Africa South of Equator between Longitude 29 degrees and 40 degrees East and Latitude 1 degrees and 11 degrees 75 minutes South. The country shares border with her neighbours Kenya and Uganda in the North, the Indian Ocean to the East,Mozambique and Malawi to the south, Zambia to the South West. Zaire to the west and Burundi and Rwanda to the North West. The country also shares the three great Lakes of Africa namely Victoria with Kenya and Uganda Tanganyika with Zaire, Zambia and Burundi,Nyasa with Malawi and Mozambique. The country's surface area is about 937,062 square kilometers with a population of about 23.2 million people (1988 census). The average annual rainfall is about 1,125 millimeters.

This paper attempts to provide a brief information regarding water quality status and national action plans regarding water quality management as undertaken by the Ministry of Water, Energy and Minerals in collaboratoion with other Ministries and agencies like Local Government (city council), Ministry of Health,National Environmental Management Council.

2.0. HISTORY OF WATER QUALITY MONITORING ACTIVITIES IN TANZANIA

Water quality monitoring activities in this country started on an irregular basis at the chief government laboratories (Ministry of Health)in the early fifties and analysis was carried out by individuals due to certain interests. The Water Development Institution at that time was not required by Law to carry out water quality monitoring.

As time went by and with the government recognizing the need to provide the people with safe/potable water, the question of quality was also emphasized.

In 1971 the Ruling Party decided that in 20 years time all Tanzanian should be supplied with a source of adequate clean and safe water within an easy reach from their household. Infulfiling the Party directive, the then Ministry of Water Development and Power took over the task of water quality monitoring from the Chief Government Chemist (Ministry of Health) and established its own water quality laboratory in Ubungo Dar es Salaam early 1970/71 which is now the Central Laboratory.

The purpose of the laboratory being to check the quality of all newly exploited water sources,the existing water schemes and the potential water supplies.

3.0. WATER QUALITY SITUATION IN THE COUNTRY

Tanzania as is the case in many developing countries some people especially in rural areas are still using untreated water from Lakes, Rivers shallow wells, Springs, Streams and Boreholes some of which are biologically and Chemically poiluted. this pollution is either brought about by the consumer themselves during water drawing, bathing, washing or through domestic waste discharge of effluent from industries, runoff from agricultural activities and sometimes due to Natural Mineralization as is the case of occurrence of high concentrations of fluoride in Arusha, Kilimanjaro, Singida, Dodoma,Mwanza,Shinyanga and some parts of Mara, Tanga and Mbeya Regions. Sometimes even the treated water (tap water) is bacteriologically contaminated due to pipe leakages during conveyance, and it has also been noted that sometimes drinking water at household levels is polluted/contaminated through water mishandling procedure during storage. This has been confirmed through source to mouth studies.

An interpretation of the data obtained from the sampling of boreholes, protected springs, open springs,streams, ponds around the country indicates that boreholes are the best water sources. Where borehole water has been found to contain any pollution the source is due to leakages infiltration, of poilutants, leaching of minerals from rising mains, natural mineralization as is the case with many borehole with high

fluoride concentration or the beneficiaries pollute during water drawing (for open well).

Although treated water (from conventional treatment plants) is the best type of water due to the fact that the water is disinfected, sometimes it could also contain faecal coliforms again this is either due to leakages in the distribution

system or due to poor control of disinfectant dosage. Samples analyzed at water laboratories are sometimes found to contain bacteria (faecal coliforms) which represent a health risk.

The quality of drinking water in the investigated sources throughout the country can be summarized as follows:-

(i) Boreholes - suitable for use without treatment provided pump base and sealants are firmly intact.

(ii) Rain water and Protected wells:- Suitable for use without treatment.

(iii) Springs and impoundments - (Moderate quality) but treatment may be required depending on the location of the water source.

(iv) Streams, rivers,lakes, pit sand open wells - worst in quality, should be avoided if possible, otherwise the water from these sources must be treated.

Generally one of the recommendations we give to our customers is that the water must be boiled before drinking even if it is from the boreholes.

3.1 Water Pollution

Three major sources of water pollution are common in Tanzania that's due to industrial effluent discharged in water bodies, domestic waste and agricultural ruoniff.

3.1.2. Domestic Waste

Many surface water sources in the country are bacteriologically polluted due to uncontrolled disposal of sewarage and other waste resulting from domestic use of water and improper disposal of domestic solid waste. The discharge of domestic waste waters into the nearby ocean, lakes, and rivers in Tanzania substantially contributes to the pollution of potential drinking water sources. An example is the discharge of the waste from the following towns:- Tanga, Dar es Salaam, Kilwa, Zanzibar, Mtwara and Lindi into the Indian Ocean. While Bukoba, Mwanza and Musoma discharge their domestic waste water into Lake Victoria, Kigoma town into Lake Tanganyika, Morogoro and Moshi empty into Morogoro and Njoro rivers respectively.

3.1.3. Industrial Pollution

Many Industries in Tanzania have been constructed without water treatment facilities. Even thosewith such facilities they breakdown and due to economic situation it may take a long time to repair such that the effluent is left over flowing or discharged directly to the Water bodies. Industries in Morogoro (Tanneries and Canvas mill), Dar es Salaam l(Textile mills, Breweries, Dry,Abators etc),Moshi (Kibo Match and Tanneries), Mwanza (Textile, Edible Oil refinery and Fish processing industry), Tanga (Sisal processing) and Industries in other towns also discharge their effluents in water bodies.

3.1.4. Agricultural Practices

More than 85 percent of the countries population depend on agriculture as their means of earning their living. In order to increase the yield, fertilizers, herbicides, pesticides, insecticides, fungicides etc are used. During heavy rains all these are washed down into the surface water bodies and sometimes into uncovered shallow wells endangering the peoples health.

3.4.0.WATER QUALITY MONITORING SYSTEMS IN THE COUNTRY

The overall objective of the water quality monitoring activities in Tanzania is to ensure that the quality of the water sources in the country is maintained at a satisfactory acceptable level. In fulfilling the above mentioned objective, work has been done on setting systems for water quality surveillance which includes sanitary inspections, Physical-chemical and bacteriological examination of water supply.

The Ministry of Water, Energy and Minerals is trying hard to ensure that clean, and safe water is supplied to the people. To achieve this target, up to now the Ministry has done the following:-

(i) The establishment of the first water quality Laboratory in the country (1970) which now is the Central Laboratory.

(ii) The formulation of Tanzanian temporary standards for drinking water 1978 and temporary standards for

effluents and receiving water (1978)

(iii) An introduction of a three year water Laboratory technician's course at the Water Resources Institute (Dar es Salaam).

(iv) The construction and equipping of ten regional/zonal water quality laboratories in addition to the central laboratory.

Todate there are 14 laboratories and the 15 one is under construction in Moshi. Donor agencies and Governments providing some kind of support to these laboratories are as follows:-

1. Dar es Salaam - The Government of Tanzania (Central Laboratory.
2. Kigoma - NORAD
3. Sumbawanga - NORAD
4. Mtwara - FINNIDA
5. Songea - DANIDA
6. Mbeya - DANIDA
7. Iringa - DANIDA
8. Mwanza - SIDA
9. Bukoba - SIDA
10. Musoma - SIDA
11. Shinyanga - Netherlands Government
12. Singida - Australian Government.
13. Tanga - GTZ (Germany)
14. Arusha - GTZ (Germany)
15. Moshi - Tanzania Government and KFW (Under construction)

(v) The introduction of water quality monitoring legislation.
(vi) The execution of water research programmes (Currently Water Defluoridation).

4.1. National Water Quality Monitoring Programme
It is very clear that water quality and effluent standards can best be checked by water quality monitoring programme. The water testing laboratories have been established for the purpose of regularly checking of water quality from the water supply schemes, domestic and industrial effluent, receiving waters, potential water sources e.g. rivers, lakes, springs etc and to examine the quality of the water from the newly exploited water supply sources such as boreholes.

4.1.1. Physical - Chemical Analysis
Irrespective of the size of the population, all types of waters are supposed to be visited at least two times per year. One under dry conditions and once under rainy conditions. Bacteriologically however the number of visits depends on the following factors:-

(i) Size of the population served.
(ii) Risk of pollution i.e. distance from and nature of pollution source.
(iii) Nature and extent of sanitary protection of the source.

Regarding the Nation Water Quality Monitoring Programme emphasis is placed on water supplies in Urban areas mainly Dar es Salaam, Regional Headquarters, District Headquarters, Large water supply schemes, eg. Handeni Trunk Main, Boreholes and Impoundments.

In the case of Dar es Salaam water quality monitoring, there are about 60 sampling stations. Each station has to be visited at least twice in a week to determine the amount of free residual chlorine and to analyse the water bacteriologically.

4.2. Training
Besides the fact that Technicians are trained at the Water Resource Institute and Chemist/Microbiologist at the University of Dar es Salaam.. From time to time they require upgrading trained or further training. Most of this type of training is conducted out of the country, to train one person from the almost impossible. The water laboratory faces one problem in this aspect which is lack of qualified personnel in instrumentation, and other fields.

Hydrological Activities in Burundi

Burundi is a country rich in hydrography. It is divided into two large, principle watershed basins:

1. The Ruvubu basin (Nile);
2. The Lake Tanganika basin.

The hydrological reserve includes sixty stations spread amongst the two watershed basins and are equipped with limnological keys for each of the measurement sections.

Apart from the limnological observations, which have been taken over a long period of time, measurements of speed and flows were started in 1960.

In 1974 two services were set up in Burundi:

1. The Hydromet project which occupied the Ruvubu basin;
2. The Italian project (ITS) which occupied the Lake Tanganika basin.

The two services evolved up to 1980, the year in which the Burundi Geographical Institute was created. The Institute has as an objective; getting all base data in the country (agrometerological, hydroclimatographical, hydrogeological, topographic, cartographic, etc). Thus, it has assisted in the creation of a National Hydrology Service.

The services biggest programmes are the following:

1. Evaluate quantity and quality of all the water courses in the country;
2. Determine annual water measurement;
3. Analyse and publish all collected data.

The programme has been followed, except in the area of water quality which has come up against two constraints:

1. The lack of laboratory and equipment;
2. The lack of qualified personnel.

However, since 1987 measurements have been made at the sixty hydrological stations.

In reality, these parameters are measured:

1. pH;
2. Temperature;
3. Suspended solids.

Given that the great demand for the data adds to the argument that the service should be permanent ...

Water quality evaluation is becoming one of the biggest of the programmes.

Alongside the hydrological service, there is REGIDESO (the countries water and electricity service) who are interested in water consumed in urban centres, where the highest priority is to bring water quality in line with water quality standards set by the WHO.

Today the country is doing everything to face this principle problem which constitutes a danger for all living things.

Evaluation of Water Quality in Burundi

Water quality is going to become one of the greatest worries of the different Authorities in charge of water in Burundi.

Hydrology Service

This is part of the Burundi Geographical Institute (IGEBU) - within the ministry of tourism and environmental management. The Hydrology Service is entrusted with calculating river flow , gathering hydrological data, and taking samples for analysis.

Evaluation of Water Quality at the IGEBU

Water quality evaluation will never be truly valuable because there is a lack of facilities:

1) No appropriate laboratory;
2) No equipment and consumables;

In reality only pH, temperature and suspended solids can be measured.

Methods Used

1) pH: measured with pH meter and glass electrode
2) Temperature: measured with a thermometer
3) Suspended solids:
    a) filtration of the sample;
    b) use of a precision balance, after drying at 100°C, to calculate weight of suspended materials.

Data

The samples are taken at some sixty functioning hydrological stations. The first samples date from 1987. The data have not yet been published, but they are available for inspection at the Burundi Geographical Institute.

Funding, Equipment and Cooperation

Funding is granted by the Burundi government, and the major part of the project equipment from WHO.

Evaluation of water quality has not yet been recognised for its true worth within the Geographical Institute, national cooperation between the departments services concerned in this area is virtually non-existent.

Future Projects

In the future, a specific aim will be to reconcile the problem of water quality within the Burundi Geographical Institute. There could also be cooperation with other interested departments/services in the country also involved in this area.

ETHIOPIA PROPOSED COUNTRY WORK PLAN

1. PRESENT SITUATION

In Ethiopia there is no properly established water quality monitoring network to date. Consequently, the quality status of the country's water resources (both surface and ground waters) remain unknown except for some sporadic and project specific studies done over a few of the river basins.

The importance of establishing a national water quality monitoring network has been recognized by the Ethiopian Valleys Development Studies Authority (EVDSA) and essential steps are now being undertaken. EVDSA has recently drafted a proposal to conduct a nation-wide water quality survey programme which could help in providing a baseline data and guidance for the establishment of the national water quality monitoring network. At present the Authority is looking for potential funding agencies to proceed with the programme as soon as possible and we believe that the assistance of GEMS or UNEP in looking for potential funding agencies is considerably important.

Although the feasibility of the proposed survey strongly depends on the availability of fund, the proposed time frame for the completion of the survey is four years and is divided into four different phases as follows:-

Phase 1: A review of existing data and preparation for a preliminary survey - (6 months)
Phase 2: Execution of preliminary survey and evaluation of results; design of the main survey - (1 year).
Phase 3: Execution of the main survey - (2 years)
Phase 4: Analysis and evaluation of results; preparation of draft standards and regulations; design of monitoring network - (6 months).

2. IDENTIFICATION OF KEY PROBLEMS

The following are some of the key problems identified as far as the absence of monitoring network in Ethiopia is concerned:

- Lack of laboratory and inadequacy of field test equipment and consumables.
- Inadequate trained manpower
- Absence of baseline data and water quality control regulations.
- Finance.

3. SUPPORTS/REQUIREMENTS

In addition to what has been mentioned as a requirement for the proposed nation-wide water quality survey programme, it is possible to undertake water quality assessment in river basins where pollution problems are much pronounced due to increased anthropogenic activities (e.g. Awash Basin), provided that the assistance with the following items is possible.

- consumables for HACH field test kits.
- BOD/DO meter probes and accessories
- Field test kits for Bacteriological analysis with adequate consumables.

4. PROPOSED ACTIVITIES FOR THE NEXT 12 MONTHS

- Completion of phase - 1 (as a whole) and phase - 2 (partial) of the proposed nation-wide water quality survey programme.
- Identification of sampling stations for the assessment of water quality in the Awash Basin.
- Analysis of basic physical and chemical parameters and bacteriological examination for samples to be collected from the stations which will be identified in the Awash Basin.
- Facilitate background conditions for the introduction of GEMS/Water programme in Ethiopia.
- Strengthening the national capability in establishing the national water quality monitoring network in collaboration with other concerned national and international organization.

- 1st sampling - last week in February (dry season)
- 2nd sampling - middle of July (onset of rains)
- 3rd sampling - last week of September (peak of rains)

Hydrology Data Compilation

- By Hydrology Division of Architectural & Engineering Services Corporation to coincide with sampling times on all stations.

Reporting

- Data compiled by secretariat for 1991. Yet to be sent to Burlington.

Support/Requirements

- Laboratory Equipment for GWSC laboratories to improve sampling range.
- Sampling frequency can be improved if transport facilities and more funds are committed by central government (or from other sources) to the programme.
- Inter-laboratory calibration to be initiated with the availability of transport.
- More copies of GEMS/Water operational guide required for all participating laboratories to standardise analytical methods. (6)
- Reagents needed to investigate BOD variations at different standardised temperatures and also membrane lauryl sulphate broth for faecal coliforms.

GHANA Country Action Plan

Present Situation

Sampling Sites (identified)
- Network of 35 stations

Sampling Sites (existing)
- Network of 26 stations

Range of Analysis
- Physical and chemical parameters comprising Alkalinity, pH, temperature, conductivity, DO, potassium, calcium, sodium, magnesium, iron, chloride, sulphate, nitrate, orthophosphate total hardness, total solids, dissolved solids.

Frequency of Sampling
- Monthly for 18 stations
- Quarterly for entire network of 26 stations (existing)

Reporting
- Quarterly data compilation, analysis and publication

GEMS/Water Programme

Sampling Sites (identified)
Surface Water
- Dalon (White Volta River)
- Daboase (Pra River)
- Weija (Weija Reservoir, Densu River)
- Kpong (Kpong Reservoir, Lower Volta River)
- Barekese (Barekese Reservoir, Ofin River)

Ground Water
- Malejor (Accra Plains)

Sampling Sites (Sampled)
- Dalon (Ghana Water & Sewerage Corp, Inst of Aquatic Biology)
- Daboase (Ghana Water & Sewerage Corp, Water Resources Res. Inst.)
- Weija (Ghana Water & Sewerage Corp, Inst of Aquatic Biology)
- Kpong (Ghana Water & Sewerage Corp, Inst of Aquatic Biology)

Range of Analysis

Contribution by Ghana Water & Sewerage Corp (GWSC) laboratories

Alkalinity, pH, temperature, total coliforms, faecal coliforms, calcium, manganese, iron, chloride, ammonia, nitrate, nitrite, sulphate, silica, total suspended solids, magnesium.

Contribution by IAB/WRRI

Dissolved Oxygen, potassium, COD, Copper, Lead, Zinc, Orthophosphate, total phosphorus, cadmium, conductivity, transparency, fluoride.

Frequency of Sampling

- GWSC: frequency of once a month
- IAB/WRRI: 3 times in a year

NIGERIA Proposed Country Work Plan

1.0 Present Situation

At present Nigeria's GEMS/Water programme is at the preparation stage. A national technical commitee has been established and has a responsibility for planning issues. This is composed of the following:

a) Federal Environmental Protection Agency (FEPA) - Chairman
b) National Insitute for Freshwater Fisheries Research
c) Federal Ministry of Agriculture, Water Resources and Rural Development.
d) Federal Ministry of Health and Human Services
e) World Health Organization (Nigeria Representative)
f) Nigerian Institute of Oceanography and Marine Research
g) Federal department of Meteorology
h) Chad Basin Development Authority

2.0 Sampling Sites

12 sampling sites have been proposed and distributed as follows:

Baseline stations	:	2 International Rivers
Trend stations	:	2 Ground water, 6 Rivers
Global Flux stations	:	2 Rivers

Each of the twelve stations have been assigned to agencies in whose jurisdiction the sampling stations are located. These stations will be sampled monthly for GEMS/WATER basic parameters (except for flux stations which include hydrometric data) and reports sent to FEPA, the coordinating agency from where such reports will be transmitted to the Nigerian WHO office and Burlington. FEPA will sample for use-related parameters, twice a year (one dry season, and one rainy season). FEPA will also be responsible for QC and QA.

3.0 Identification of Key problems

Although the GEMS/Water programme has not taken off, anticipated problems include:

a) standardisation of equipment
b) training of personnel
c) logistics

10. 予想応募機関リスト

ETHIOPIA

MINISTRY OF AGRICULTURE
ADDRESS: P.O.Box: 1223. Addis Ababa
Tel: 445640. Tlx: 21390 Minag et .
c/o : H.E. The Minister
ACTIVITIES: Irrigation projects. hydrogeological survey: pumping stations and canalization.

MINISTRY OF MINES, ENERGY AND WATER RESOURCES
ADDRESS: P.O.Box 486 Addis Ababa
Tel: 448250. 447597
c/o : H.E. Minister
ACTIVITIES: Urban and rural water supply and sanitation.

MINISTRY OF URBAN DEVELOPMENT AND HOUSING
ADDRESS: P.O.Box 3386. Addis Ababa
Tel: 150000. 155736
c/o : H.E. Minister
ACTIVITIES: Civil Engineering; water supply. drainage and sewerage.

NATURAL WATER RESOURCES COMMISSION
ADDRESS: Addis Ababa. Ethiopia
Tlx: c/o 21531 ONOCP Tel: c/o 128953
c/o: The General Manager

WATER RESOURCES DEVELOPMENT AUTHORITY
ADDRESS: P.O.Box 5673 . Addis Ababa. Ethiopia
Tel/Fax: 183197
c/o: Senior Economist.
ACTIVITIES: Planning and management of water resources.

WATER SUPPLY AND SEWERAGE AUTHORITY
ADDRESS: P.O. Box 5744. Addis Ababa
Tlx: 21387

MINISTRY OF LOCAL GOVERNMENT AND RURAL DEVELOPMENT
ADDRESS: Mogadishu
c/o : H.E. The Minister
ACTIVITIES: Water supply treatment and network extension.

MINISTRY OF MINERAL AND WATER RESOURCES
ADDRESS: P.O.Box 744, Mogadishu
Tel: 8980
c/o : H.E. The Minister
ACTIVITIES: Research and exploration of minerals and water resources.

MINISTRY OF OIL, WATER AND MINERAL RESOURCES
ADDRESS: Mogadishu
c/o : H.E. The Minister
ACTIVITIES: Irrigation projects; canalization.

MINISTRY OF PUBLIC WORKS
ADDRESS: Mogadishu
Tel: 21051
c/o : H.E. The Minister
ACTIVITIES: Water supply; drainage and sewerage.

SOUTH AFRICA

INSTITUTE OF NATURAL RESOURCES
ADDRESS: University of Natal,
Computing Center for Water Research (CCWR)
P.O. Box 375, Pietermaritzburg 3200
Tel: 0331-68317 Tlx: 621231 Telefax: (0331) 68891
c/o: Acting Director
ACTIVITIES: Farm level economics; land tenure; settlement.

UMGINI WATER
ADDRESS: P.O.Box 9
Pietermaritzburg 3200
c/o: Director, Corporate Services

WATER RESEARCH COMMISSION
ADDRESS: P.O. Box: 824
PRETORIA 0001
c/o: Deputy Director

SOKOTO-RIMA RIVER BASIN DEVELOPMENT AUTHORITY
ADDRESS: Sokoto
c/o: General Manager
ACTIVITIES: Harnessing water resources for development.

UNIVERSITY OF CALABAR
ADDRESS: Faculty of Agriculture
PMB 1115, Calabar
Tel/Fax : 087-222855 Tlx: 65103-UNICAL
c/o: Dean
ACTIVITIES: Environmental impacts; irrigation agronomy.

UNIVERSITY OF ILORIN
ADDRESS: Dept. of Agricultural Econs. and Farm Management
PMB 1515, Ilorin, Nigeria
Tel/Tlx: 221945
c/o: Head of Deptarument
ACTIVITIES: Farm level economics.

UNIVERSITY OF JOS
ADDRESS: Agricultural Economics Deptarument.
Makurdi Campus, Makurdi, Nigeria
c/o: Head of Deparument
ACTIVITIES:

UPPER-BENUE RIVER BASIN DEVELOPMENT AUTHORITY
ADDRESS: P.M.B. 2086 - Yola
c/o: General Manager
ACTIVITIES: Harnessing water resources for development.

RWANDA

MINISTRY OF AGRICULTURE AND LIVESTOCK
ADDRESS: P.O.Box 621, Kigali
Tel: 5689
c/o : H.E. The Minister
ACTIVITIES: Farming irrigation; projects development; hydrogeological works; well-drilling; pumping stations and canalization.

MINISTRY OF MINES, ENERGY AND HYDRAULIC RESOURCES
ADDRESS: P.O.Box 576, Libreville
Tel: 721606 , Tlx: 5352 Minergie
c/o : H.E. The Minister

ACTIVITIES: Generation of electricity; mapping.

MINISTRY OF NATURAL RESOURCES, MINES AND QUARRIES
ADDRESS: P.O.Box 413, Kigali
Tel: 5265
c/o : H.E. The Minister
ACTIVITIES: Water population detection; hydrogeological works.

MINISTRY OF PLANNING
ADDRESS: P.O.Box 46, Kigali
Tel: 5775
c/o : H.E. The Minister
ACTIVITIES: Planning, execution and supervision of water works.

MINISTRY OF PUBLIC WORKS
ADDRESS: P.O.Box 24, Kigali
Tel: 6573
c/o : H.E. The Minister
ACTIVITIES: Urban sanitation ; planning and execution of housing complexes; civil engineering; water supply; drainage and sewerage.

SENEGAL

INSTITUTE SENEGALAIS DE RECHERCEES AGRICOLES
ADDRESS: P.O.Box 29, Richard-Toll
c/o: Director
ACTIVITIES: Performance; monitoring; choice of water delivery systems.

MINISTRY OF RURAL DEVELOPMENT
ADDRESS: Building Administratif, Dakar
Tel: 231088, Tlx: 3151, Coorcils Sg.
c/o : H.E. The Minister
ACTIVITIES: Planning, supervision and control of rural works; water supply treatment and network extension.

MINISTRY OF URBAN AFFAIRS, HOUSING AND DEVELOPMENT
ADDRESS: Building Administratif , Dakar
Tel: 231088, Tlx: 482, 483.285
c/o : H.E. The Minister
ACTIVITIES: Water supply; drainage and sewerage.

ACTIVITIES: Meteorology.

FEDERAL MINISTRY OF AGRICULTURE AND NATURAL RESOURCES
ADDRESS: Area 11, Garki, P.M.B. 50 , Abuja
c/o: H.E. The Minister
ACTIVITIES: Harnessing water for agriculture, livestock, forestry and fisheries.

FEDERAL MINISTRY OF BUDGET AND PLANNING
FEDERAL SECRETARIAT
ADDRESS: Ikoyi, Lagos
c/o: H.E. The Minister
ACTIVITIES: Planning and coordination.

FEDERAL MINISTRY OF MINES AND POWER
ADDRESS: Federal Secretariat, Ikoy
Lagos
c/o: Director-General
ACTIVITIES: Planning and management of hydropower resources.

FEDERAL MINISTRY OF TRANSPORT
ADDRESS: Marina, Lagos
c/o: H.E. The Minister
ACTIVITIES: Hydraulic works for navigation.

FEDERAL MINISTRY OF WATER RESOURCES
(responsible for all River Basin Authorities)
ADDRESS: Area 1, Garki P.M.B. 159
Aduja
Tel: 612511, 603250, Cable: FEDWATER
Tlx: 612511 FED WATER
c/o: H.E. The Minister
ACTIVITIES: Planning and management of water resources legislation, water supply and irrigation.

FEDERAL MINISTRY OF WORES AND HOUSING
ADDRESS: Tafawa Balewa Square, Lagos
c/o: H.E. The Minister
ACTIVITIES: Drainage and Sewerage works, water supply.

FEDERAL UNIVERSITY OF TECHNOLOGY
ADDRESS: PMB 704, Akure, Ondo State, Niger
c/o: Dean
ACTIVITIES: Technology and design to facilitate management.

ACTIVITIES: Water exploration and dam construction: water supply; water affairs.

GENERAL WATER AUTHORITY
ADDRESS: P.O.Box 399, Alfath Road, Tripoli
Tel: 41695
c/o: Chairman
ACTIVITIES: Water supply projects: planning and supervision.

GENERAL WATER MANAGEMENT
ADDRESS: P.O.Box 638, Al-Marj
Tel: 22099 Tlx: 50461 Projabal
c/o: Director
ACTIVITIES: All water management and supervisions drilling; irrigation, etc...

KUFRA AND SARIR AUTHORITY
ADDRESS: P.O.Box 2547, 6324, 4239, Benghazi
Tel: 87315/6, 20245, 25862
Tlx: 40134 Kufrag Ly
c/o: Chairman
ACTIVITIES: Responsible for the execution of the Kufa project in the South-East.rn part of Libya ; land reclamation and exploitation of groundwater.

WATER AFFAIRS INSTITUTE
ADDRESS: P.O.Box 399 Tripoli
c/o: Institute Director
ACTIVITES: Water Affairs Institute

MADAGASCAR

DIVISION DE L'HYDROLOGIE, SERVICE DE LA METEOROLOGIE
ADDRESS: c/o Ministere Des Transports Du Ravitaillement Et Du Tourisme
B.P. 1254, Antananarivo 101, Madgascar
Tlx: c/o UNDEVPRO
c/o : Chef de Division.

MINISTERE DE L'AGRICULTURE DIRECTION DU GENIE RURAL DE L'HYDRAULIQUE AGRICOLE L'AMENAGEMENT RURAL
ADDRESS: P.O.Box 1061, Manisana, Antananarivo
c/o: S.E. Le Ministre

ACTIVITIES: Governmental organization for the management and engineering development of hydraulic agriculture of the rural areas.

MINISTERE DE LA RECHERCHE SCIENTIFIQUE ET TECHNOLOGIE POUR LE DEVELOPMENT
ADDRESS: B.P. 4285, Antananarivo 101, Madgascar
Tlx: 22539 MRST MG Tel: 19261/21719
c/o: S.E. Monsieur Le Ministre

MINISTERE DES TRAVAUX PUBLICS
ADDRESS: BP 295, Antananarivo
c/o: S.E. Le Ministre
ACTIVITIES: Planning and supervision of housing complexes; civil engineering; water supply; drainage and sewerage.

MINISTRY OF PUBLIC WORKS
ADDRESS: Anosy, Antananarivo
Tel: 24224; Tlx 22343
c/o: H.E. The Minister
ACTIVITIES: Planning and execution of housing complexes; civil engineering; water supply; drainage and sewerage.

MINISTRY OF RURAL DEVELOPMENT AND RURAL REFORM
ADDRESS: Water Engineering Division
Anosy, Antananarivo
Tel: 24710 . Tlx: 22339
c/o : H.E. The Minister
ACTIVITIES: Planning, supervision and control of rural works which includes: water supply treatment, networks extension and effluent treatment.

MALAWI

CHITEDZE AGRICULTURAL RESEARCH STATION
ADDRESS: P.O.Box 158, Lilongwe, Malawi
Tel/Fax : 767222
Tlx: 4648 MINAGRIC
c/o: Director

DEPARTMENT OF LANDS, VALUATION AND WATER
ADDRESS: P.O.Box 458, Lilongwe 3
c/o: Head of Department
ACTIVITIES: Water and sanitation public agency.

ACTIVITIES: Irrigation projects; drainage projects; dams; canals; water well-drilling and pumping stations.

MINISTRY OF PLANNING
ADDRESS: Koulouba, Bamako
Tel: 225780, 225530
Tlx: 412 Miniplan, Bamako
c/o : H.E. The Minister
ACTIVITIES: Planning and supervision for projects related to water supply; drainage construction.

MINISTRY OF PUBLIC HEALTH AND SOCIAL AFFAIRS
ADDRESS: Koulouba, Bamako
Tel: 225301/02
c/o: H.E. The Minister
ACTIVITIES: Technical support and water quality control.

MAURITANIA

ECOLE NAT. AGRICULTURE
ADDRESS: BP 37, Kaedi, Mauritania
c/o: Director
ACTIVITIES: Feasibility study methodology; data collection; farmer training; extension methods.

MINISTERE HYDRAULIQUE ET HABITAT
ADDRESS: Direction De L'Hydraulique
BP 356 Nouakchott
c/o: Le Directeur
ACTIVITIES: Water and sanitation public agency.

MINISTRY OF RURAL DEVELOPMENT
ADDRESS: BP 3, Rosso, Mauritania
Tel/Fax: 69174
c/o: Director of M'Pourie Farm
ACTIVITIES: Rehabilitation; upgrading farmer participation; water users' association cooperatives.

MINISTRY OF RURAL DEVELOPMENT, WATER ENGINEERING OFFICE
ADDRESS: P.O.Box 366, Nouakchott
Tel: 52020, Ext. 386
c/o : H.E. The Minister

ACTIVITIES: Planning, supervision and control of rural works which includes water supply treatment, networks extension, effluent treatment.

MAURITIUS

CENTRAL WATER AUTHORITY
ADDRESS: Technical Office, Royal Road, St. Paul, Mauritius
Tel/Fax: 865071
Tx: 4665
c/o: General Manager
ACTIVITIES: Rehabilitation: upgrading staff management: staff rations; incentives; training.

IRRIGATION AUTHORITY
ADDRESS: 17, de Poivre Street, Fon Sing Building, Edith Cavell St., Port Louis, Mauritius
Tel: 2-5391, Cable: Irrigate, Port Louis, Mauritius
c/o: General Manager
ACTIVITIES: Studying development of irrigation and making proposals to the Central Water Authority for the preparation of schemes for the irrigation of specific areas; implementation and management of irrigation projects in every irrigation area. Research on the optimum use of water made available by the central water authority for irrigation.

MINISTRY OF AGRICULTURE, FISHERIES AND NATURAL RESOURCES
ADDRESS: New Government Center, Port Louis
Tel: 011058, Tlx: 4249 EXTERN IW
c/o : H.E. The Minister
ACTIVITIES: Irrigation projects and development; hydrogeological surveys and works; well-drilling; pumping stations; canalization; dams; planning; supervision and control of environmental works.

MINISTRY OF HOUSING, LANDS AND TOWN AND COUNTRY PLANNING
ADDRESS: Edith Cawell Street, Port Louis
Tel: 082831, Tlx: 4249 Extern
c/o : H.E. The Minister
ACTIVITIES: Planning and execution of housing complexes; civil engineering; water supply; drainage and sewerage.

c/o: Director of Research
ACTIVITIES: Water researches and planning development.

MINISTRY OF PUBLIC WORKS
Directorate of Research and Water Planning
Water Engineering Department
ADDRESS: Rabat
c/o: Head of Department

OFFICE NAT'L DE L'EAU POTABLE
ADDRESS: Service Régional de Casablanca
Bureau Etude et Travaux
Angle Boulevard Youssef Ibn Tachfine et Colonel Bérier, Casablanca
Tel: 44503, Tlx: 31982
c/o: Director
ACTIVITIES: Distribution of water for drinking and industrial use.

MOZAMBIQUE

MINISTRY OF AGRICULTURE
ADDRESS: Lg. Herois da Libertacao, Maputo
Tel: 21017, Tlx: 6209 Magri Mo.
c/o: H.E. Vice Minister
ACTIVITIES:. Irrigation Projects and development; hydrogeological surveys and works; well-drilling; pumping stations; canalizations; dams ; etc...

MINISTRY OF PUBLIC WORES AND HOUSING
ADDRESS: National Directorate for Water Affairs
606 Avenida Karl Marx, Maputo
Tel: 30028
c/o : H.E.The Minister
ACTIVITIES: Urban and rural water supply; sanitation.

NIGER

AUTORITE DE BARRAGE DE KANDADJI
ADDRESS: Niamey
c/o: Le Directeur-Général
ACTIVITIES: Dams, irrigation and drainage works.

AUTORITE DU BASSIN DU NIGER (NINE MEMBER COUNTRIES)
ADDRESS: Niamy
c/o: S.E. Le Secrétaire Exécutif
ACTIVITIES: Water resources planning and management.

INRAN, DEV. RECEERCHE EN ECONOMIE RURALE
ADDRESS: BP 429 Niamey, Niger
Tel/Fax: 733670
c/o: Director
ACTIVITIES: Farm level economics, incomes, marketing.

MINISTERE DE L'AGRICLTURE ET DE L'ELEVAGE
ADDRESS: Niamey
c/o: S.E. Le Ministre
ACTIVITIES: Water supply and harnessing water for agriculture.

MINISTERE DE L'EQUIPMENT
ADDRESS: Niamey
c/o: S.E. Le Ministre
ACTIVITIES: Planning and execution of water supply, drainage and sewerage schemes.

MINISTERE DE L'EYDRAULIQUE ET ENVIRONMENT
ADDRESS: Niamey
c/o: S.E. Le Ministre
ACTIVITIES: Hydraulic works, hydrogeological surveys.

MINISTERE DE LA SANTE PUBLIC
ADDRESS: Niamey
c/o: S.E. Le Ministre
ACTIVITIES: Water supply and sanitation.

MINISTERE DE TRANSPORTS ET L'AVIATION CIVILE
ADDRESS: Niamey
c/o: S.E. Le Ministre
ACTIVITIES: Meteorological, river navigation works.

MINISTRY OF PLANNING
ADDRESS: Niamey
Tel: 722233, 723577
Tlx: 5214 Presirep
c/o: H.E. The Minister
ACTIVITIES: Planning and coordination

MINISTRY OF WORKS
ADDRESS: P.O.Box 9493, Dar Es-Salaam
Tel: 23235
c/o : H.E. The Minister
ACTIVITIES: Planning and execution of houses complexes.

NATIONAL URBAN WATER AUTHORITY
ADDRESS: P.O. Box 5340, Dar Es-Salaam
Tel: 48497
c/o: Director-General
ACTIVITIES: Urban water supply; water rural works.

TOGO

MINISTRY OF MINES, ENERGY, HYDRAULIC RESOURCES AND PUBLIC WORKS
ADDRESS: Rue Colonel de Roux, Lomé
Tel: 7942, 2783
c/o: H.E. The Minister
ACTIVITIES: Urban and rural water supply; mapping.

MINISTRY OF PUBLIC HEALTH
ADDRESS: Rue Colonel de Roux, Lomé
Tel: 3801, 2518, 2514, 5006
c/o : H.E. The Minister
ACTIVITIES: Water quality control.

MINISTRY OF RURAL DEVELOPMENT
ADDRESS: Rue Colonel de Roux, Lomé
Tel: 3801, 3390, 5287
c/o: H.E. The Minister
ACTIVITIES: Planning and supervision of rural works.

REGIE NATIONALE DES EAUX DE TOGO
ADDRESS: P.O.Box 1301, Lomé
c/o: Le Directeur
ACTIVITIES: Water and sanitation public agency.

AGRICULTURAL RESEARCH CORPORATION
ADDRESS: Wad Medani, Sudan
c/o: Director

MINISTRY OF AGRICULTURE AND NATURAL RESOURCES
ADDRESS: P.O.Box 635, Khartoum
c/o: H.E. The Minister .
ACTIVITIES: Irrigation projects; hydrogeological survey.

MINISTRY OF HOUSING AND PUBLIC UTILITIES
ADDRESS: Rural Water Administration
P.O.Box 40, Khartoum
c/o: H.E. The Minister
ACTIVITIES: Rural water supply treatment and development.

MINISTRY OF IRRIGATION
ADDRESS: P.O.Box: 878, Khartoum, Sudan
Tel/Fax: 70962
c/o: H.E. The Minister
ACTIVITIES: Technology and design; feasibility study methodology.

MINISTRY OF IRRIGATION AND HYDROELECTRIC POWER (MIR)
ADDRESS: P.O.Box 90, Khartoum
c/o: H.E. The Minister
ACTIVITIES: Maintenance and operation of irrigation schemes.

UNIVERSITY OF GEZIRA
Department of Rural Development
ADDRESS: P.O.Box 20, Medani, Sudan
c/o: Head of Department
ACTIVITIES: Health issues; employment.

SWAZILAND

MANANGA AGRICULTURAL MANAGEMENT CENTER
ADDRESS: P.O.Box 20, Mniume
Tel: 31133/31334 Tlx: 2320 WD Fax: 31135
c/o: Director
ACTIVITIES: Management training.

MINISTRY OF AGRICULTURE AND FORESTRY
ADDRESS: P.O.Box 102, Entebbe, Uganda
Tel/Fax: Tlx 61287/61227
c/o: H.E. The Minister
ACTIVITIES: Performance monitoring; management of water.

MINISTRY OF ENVIRONMENTAL PROTECTION
ADDRESS: P.O.Box 4544, Kampala, Uganda
c/o : H.E. The Minister
ACTIVITIES: Environmental impacts.

MINISTRY OF LANDS, MINERAL AND WATER RESOURCES
ADDRESS: P.O.Box 7096, Kampala
Tel: 33321. Tlx: 61265 NATURAL
c/o: H.E. The Minister
ACTIVITIES: Water resources management.

NATIONAL WATER AND SEWERAGE CORPORATION
ADDRESS: Kampala
c/o: The Director
ACTIVITIES: Water and sanitation public agency.

WATER DEVELOPMENT DEPARTMENT
ADDRESS: Kampala
c/o: Department Head
ACTIVITIES: Water and sanitation public agency.

ZAIRE

DEPARTMENT OF AGRICULTURAL AND RURAL DEVELOPMENT
ADDRESS: P.O.Box 8722, Kinshasa, Gombe
Tel: 31853, 31207, 3114
c/o: Department Head
ACTIVITIES: Irrigation projects and development.

DEPARTMENT OF PUBLIC WORKS AND TERRITORIAL DEVELOPMENT
ADDRESS: P.O.Box 26, Kinshasa, Gombe
Tel: 31578, 30205, 31154
c/o: Department Head
ACTIVITIES: Water supply ; drainage and water sewerage.

MINISTRY OF PUBLIC WORKS, TRANSPORTATION AND URBANISM
ADDRESS: Niamey
Tel: 722501, 722209
Tlx: 5283 Minitrav
c/o : H.E. The Minister
ACTIVITIES: Planning and execution of housing complexes; civil engineering; water supply; drainage and sewerage.

MINISTRY OF RURAL DEVELOPMENT
ADDRESS: Niamey
Tel: 722679 Tlx: 5214 Presirep
c/o : H.E. The Minister
ACTIVITIES: Planning , supervision and control of rural works which includes water supply treatment, networks extension and effluent treatment.

MINISTRY OF WATER
ADDRESS: Niamey
Tlx: 5214 Presirep
c/o : H.E. The Minister
ACTIVITIES: Irrigation projects and development; hydrogeological surveys and works; well drilling; pumping stations.

OFFICE DES EAUX DU SOUS-SOL (OFEDES)
ADDRESS: B.P. 734
c/o: Le Directeur-Général
ACTIVITIES: Drilling wells for domestic water supply.

OFFICE NATIONALE DES AMENAGEMENT HUDRO-AGRICOLE
ADDRESS: B.P. 12728
Niamey
c/o: Le Directeur-Général
ACTIVITIES: Harnessing water resources for agriculture.

ONAHA, DEPT. DE MISE EN VALEUR
ADDRESS: BP 10697, Niamey, Niger
Tel/Fax: 732958
c/o: Chef de la Division
ACTIVITIES: Choice and management of water delivery systems; farmer participation; water users' associations.