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**INTERNATIONAL CONFERENCE ON WATER
AND THE ENVIRONMENT
DEVELOPMENT ISSUES FOR THE 21ST CENTURY**

SITUATION REPORT ON NIGERIA

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INTRODUCTION

The development and management of water resources in Nigeria has a chequered history. From the humble beginning to the present day, the progress has been monumental. This change in time and space is traced in this report. However some precious natural incidences (climatic and human) has made it necessary to acquire data for proper planning of water resources management in Nigeria.

Nigeria, the most populous country in Africa with an estimated population of about 110 million is situated along the coast of West Africa between longitudes 4°E and 14°E and latitudes 4°N and 14°N. The land area is estimated at about 92.4 million hectares, out of which 35% is classified cultivable/arable land while the remaining constitute pastures, forest reserve and non cultivable land.

The rainfall throughout the country varies from minimum in the extreme North - East to the maximum in the southern part of the country. In the latter, the rainfall tends to decrease towards the South - East and South - West and the occurrence of a short dry season, in July - August in the latter area. The annual rainfall is less than 500mm in some parts of the North and greater than 2300mm in some parts of the South. The duration of rainfall period varies between 100 and 230 days in the Northern Nigeria while it is between 270 and 300 days in the Niger Delta of the South.

Nigeria has vast surface water resources, receiving very large part of her water from drainage arteries of West and Central Africa, South of the Sahara which are international. It is a well drained country with a close network of rivers, lagoons, lakes and streams most of which carry less water in the dry season. The perennial rivers of the Northern part of the country in particular are easily depleted during prolonged dry periods.

The major surface water resources of Nigeria are those of the Niger River System, Lake Chad and Cross River, in that order of importance. River Niger rises in Sierra Leone and Guinea, flows in a South-easterly direction across the country to its confluence with the Benue at about the centre of the country and from there charts a sentuarly direction, emptying itself into the Atlantic Ocean in an extensive delta at the Gulf of Guinea. With its principal tributaries the Benue, Kaduna and Sokoto rivers, it drains an area of 575,000 square kilometres of Nigeria. The Benue, its largest tributary, rises from the Republic of Cameroon and has a catchment area of about 233,000 square kilometres in East Central Nigeria. It contributes 55 percent of the water of the lower Niger system.

Lake Chad is a shallow, fresh water lake about 15,540 square kilometres in area out of which about 4,800 km² lies at the North - East corner of Nigeria on the boundary with the Republic of Chad and the Cameroon. The Nigeria portion of the Chad Basin area is about 155,500 square kilometres with four minor streams, the Ebeji, Komadugu Yobe, Yedseram and Ngadda rivers. These four provide less than 10% of the lake in-flow, practically all of the remainder coming from the Chari River, which has its source in the Chad Republic.

The Cross River which originates in Cameroon, drains an area of about 44,030 square kilometres in the South - East corner of Nigeria.

1.0 INTEGRATED WATER RESOURCES DEVELOPMENT AND MANAGEMENT

Organised water resources development for agriculture and other uses in Nigeria did not start early, until 1955 when the International Bank for Reconstruction and Development (IBRD) Report mentioned the need for an organised approach towards harnessing the water resources of this country. Water resources development for agriculture had all along been left in the hands of small scale subsistence farmers. In 1962, however, the Federal Government finally considered it fit to include in its First National Development Plan (1962 - 1968) the issue of water resources development for crop irrigation as well as urban and rural domestic uses. Under this plan, water resources development to support food production was essentially handled by the then Irrigation Division under the Federal Ministry of Agriculture and Natural Resources while ground-water development was handled by the Geological Survey Department of the Federal Ministry of Mines and Power.

The consciousness and need for our water resources development were heightened by many factors. Among these were the need to contain the ravaging droughts in the northern part of the country and also arrest desert encroachment. Again, despite our abundant land and water resources, food importation was on the increase. Food scarcity and dependence on imported food items were worsened by the civil war, the oil boom of the seventies and the rapid rural to urban migration. Our national sovereignty as an independent country (if we had to depend on imported food), was therefore threatened.

In order to harness Nigeria's water resources to combat the effects of drought, the Federal Government in 1973 created the Sokoto Rima and Chad Basin Development Authorities. These Authorities were charged with the responsibilities of not only full development of Irrigation schemes but also water supply, flood control, pollution control, resettlement and food production.

In 1976, in a bold step to harmonise water resources development nationwide, the Federal Ministry of Water Resources was first created to formulate national water resources development policies and co-ordinate their development. This Ministry had only one operational department called the Federal Department of Water Resources with Sokoto/Rima Basin Development Authority (SRBDA) and Chad Basin Development Authority (CBDA) and Niger Delta Basin Development Authority as the only parastatals.

Also in 1976, the Federal Government through Decree No 25 set up 11 (eleven) River Basin Development Authorities (RBDAs) to cover the entire country. They had the same responsibilities as spelt out for the Sokoto Rima, Chad and Niger Delta Basin Development Authorities. All the Authorities were under the supervision of the Federal Ministry of Water Resources.

In 1977, the Federal Ministry of Water Resources was merged for the first time with the Federal Ministry of Agriculture. The Federal Department of Water Resources remained intact under this new Ministry along with the 11 RBDAs with their functions.

In 1979, a Federal Ministry of Water Resources was re-created. It still had the Federal Department of Water Resources as the only operational Department, the 11 RBDAs and the National Water Resources Institute that was established in 1978 as the parastatals.

In 1984, the Federal Ministry of Water Resources was for the second time merged with the Federal Ministry of Agriculture, Water Resources and Rural Development. In the same year, the RBDAs were reorganised into 18 River Basin and Rural Development Authorities (RBRDAs). Each RBRDA had jurisdiction boundary for each state of the Federation except for Lagos State which was combined with Ogun State.

In another reorganisation in 1987, the 18 RBRDAs were reverted to their former 11 RBDAs structure as before 1984. The RBDAs were in additional reorganised functionally to relieve them of some earlier responsibilities of direct agricultural activities including food production, forestry and livestock development.

In 1989, a Federal Ministry of Water Resources was created for the third time. This time, the Ministry had a tremendous boost and quickly expanded from one Department of Water Resources it inherited to eight new departments.

In addition to the FMWR and its parastatals some other agencies such as National Electric Power Authority (NEPA), Inland Water Ways Department of the Federal Ministry of Transport, at the Federal level, use water for hydro-power generation and inland waterway transportation respectively. Actually the first Dam in Nigeria was built at Kainji by NEPA.

1.1 Parastatals under the Ministry of Water Resources

1.1.1 River Basin Development Authorities (RSBDAs)

The River Basin Development Authorities were created to ensure that a nation-wide and systematic, as well as consistent programme of development of water resources, are achieved. The River Basin Development Authorities were also envisaged as tools to stem the rapid rural/urban migration that were attendant problems of the oil boom era. In addition, the Ministry through the River Basin Development Authorities is expected to design programmes that would reduce the effects and the devastation of erosion and flood nation-wide. Eleven such River Basin Development Authorities were created in 1976 by Decree No 25 and consolidated by Decrees No 87 of 1979 and No 35 of 1987. Over the years, the River Basin Development Authorities have gone through some operational and structural changes to improve their relevant and efficiency as spelt out in Decree No 35 of 1987.

1.1.1.1

Functions of the RBDAs

- (i) To undertake comprehensive development of both surface and ground-water resources for multi-purpose use, with particular emphasis on the provision of Irrigation infrastructure and control of flood and erosion, and for water management.
- (ii) To construct, operate and maintain dams, lakes, polders, wells, irrigation and drainage systems for achievement of Authority's functions and to hand over all lands to be cultivated on irrigation scheme to farmers.
- (iii) To supply water from completed storage/schemes to all users for a fee to be determined by the Authority with approval of the Ministry

- (iv) To construct, operate and maintain infrastructural services, such as, roads and bridges linking project sites, provided that such services are included and form an integral part of the list of approved projects.
- (v) To develop and keep up-to date comprehensive water resources master-plan, identifying all water resources requirements in the Authority's area of operation, through adequate collection and collation of water resources, water use, socio-economic and environmental data of the River Basin.

1.1.2 National Water Resources Institute (NWRI)

The National Water Resources Institute, Kaduna was established in 1978. The enabling Decree was promulgated as Decree No 3 of 1985. The major functions of the Institute are to:

- (a) Advise the Minister on national water resources training needs and priorities;
- (b) Perform engineering research functions related to such major water resources projects as may be required for flood control, river, regulations, reclamation, drainage, irrigation, domestic and industrial water supply sewage and sewage treatment;
- (c) Perform such ancillary services of planning of water resources management and river basin development and produce necessary codes of practice in water resources engineering related to and suitable to Nigerian conditions;
- (d) Promote the establishment of a uniform national data collection system relating to surface and sub-surface water resources;
- (e) Provide for the training of engineers and technicians on short courses and formulate programmes of work in the field of water resources;

- (f) Establish and maintain a water resources library, documentation and conference centre;
- (g) Establish and maintain a water resources data bank;
- (h) Promote co-operation in water resources development management with similar bodies in other countries and with international bodies connected with water resources management and operations;
- (i) Carry out such other activities as are necessary or expedient for the full discharge of its functions.

To date the Institute runs Diploma programmes in Civil and Water Resources Engineering at pre ND, ND and HND Level. All these programmes have recently been fully accredited by the National Board for Technical Education. Research studies on water resources are being carried out at the Institute also.

2.0 WATER RESOURCES ASSESSMENT

Hydrometeorological and hydrogeological data is being generated by the Ministry of Water Resources and other agencies and the FMWR is the repository for such information. This forms the backbone of water resources evaluation, planning, development and management.

2.1 Achievements

Achievements in these main areas of operation include:

- Nation-wide pre-drilling hydrogeological investigations.
- Filling in of data gaps in the pre-drilling hydrogeological investigations.
- Preparation of provisional ground-water development master plan for Nigeria.
- Geophysical exploration for siting of productive boreholes in 900 different locations nation-wide for water supply to rural communities, institutions, etc.
- Monitoring and management of hydrometric stations nation-wide.

- Establishment of:
 - * 47 staff gauging stations
 - * 82 automatic gauging stations
 - * 19 river discharge measurement stations and
 - * 26 meteorological observatories
- **Completion of 383 boreholes out of the 860 productive boreholes of the Phase I of the National Borehole Programme.**
- Drilling of 17 boreholes consisting of three in Bendel State, two each in Benue, Niger and Anambra States, one in Rivers State and seven in some local government areas of Borno State.
- Commencement of drilling of 160 boreholes in the 190 drought affected States of the country. They will include 2 wind-mills and 2 solar pumps for each state, while the remaining 128 boreholes will be fitted with conventional submersible pumps, generator sets and 22m³ overhead tanks.

2.2 Hydrogeological Programmes

2.2.1 Ground-water Resources Development

First attempt at a co-ordinated and systematic development of the ground water resources of Nigeria began at the turn of this century when the Water Supply Division of the Geological Survey Department embarked on the exploratory drilling for ground-water in Sokoto, Borno and Dikwa Emirates of the then Northern Nigeria in conjunction with United States Aid for International Development (USAID).

The emphasis at that time was the determination of resource availability in terms of quantity and quality with a view to ascertaining rates of abstraction and recharge of the two main basins in the semi-arid region of Nigeria so as to ensure development and management of the resource on a sustainable basis.

Upon establishment of the Federal Ministry of Water Resources in the middle of the 70's, it became obvious that ground-water development in the two afore-mentioned basins as well as the Niger, Benue and the Delta basins had progressed so fast that it was an uphill task to keep abreast of development because ground-water abstraction through sinking of boreholes and shallow wells were carried out by all and sundry with little or no control.

This was the state of affairs in 1976 when the Ministry was established with its present Division of Hydrogeology and Hydrology operating the then Federal Department of Water Resources. In order to put a check to this unhealthy trend, the following studies were commissioned to ascertain the state of affairs with regards to ground-water resource availability nationwide.

2.2.1.1

Pre-Drilling Hydrogeological Investigations

Consultants were commissioned to assemble all the available information on ground-water throughout the country in order to determine ground-water development prospects. The reports submitted by the consultants revealed among others that there was inconsistency and inaccuracy in data collection leading to gaps which could result in erroneous projections if used for planning purposes. It was obvious that for effective planning, something had to be done to the data base for ground-water development.

2.2.1.2

Filling-Data Gaps

In order to improve the data base for planning ground-water development, further studies were initiated to fill in the data gaps in the already concluded pre-drilling hydrogeological investigations including the installation of instrumentation where none existed before. This provided information with which reasonable extrapolations were made with regards to status of ground-water availability countrywide.

2.2.1.3

Geophysical Exploration for Siting of Productive Boreholes

Preparatory to the commencement of the drilling programme, the basement complex areas of the country were firmed out to reputable Exploration Geophysicists to determine the availability or otherwise of ground-water in selected villages and towns totalling approximately 820 in number. The reports of these geophysical investigations were of immense use in the subsequent National Borehole Programme. Approximately 80 other locations have been explored in Bendel, Niger, Plateau and FCT, prominent among which are Langtang, Keffi and Science and Technological Complex Centre in the FCT, for their respective water supply schemes.

These other locations were completed in-house and the reports have been found useful in the assessment of water supply options. In addition to above, 96 other locations out of the 160 villages and towns slated to benefit from the drought relief package in the eight drought affected states would have their prospective borehole sites on the basement complex investigated geophysically at a cost of N1.4m.

2.2.1.4

Hydrogeological and Geophysical Data Collection, Storage and Analysis

This is a nation-wide project which attempts to collate all available information on geophysical exploration to date. The contract for the project was signed with Rockview International this year.

2.3

National Hydrological Network Programme

Hydrological observation data collection and analysis are being collated by several Water Authorities nation-wide with this Ministry as the co-ordinating agency for the national hydrological services.

These other agencies include:

- Federal Department of Meteorological Services for meteorological information
- Federal Inland Waterways Department for navigation hydrological information
- NEPA for Hydropower information
- 11 Nos River Basin Development Authorities for collection of Hydrological information for multi-purpose water resources development.
- 30 Nos. State Water Boards including Federal Capital Territory Water Resources Agency for collection of hydrological information for water supply purposes.

Presently, the Federal Ministry of Water Resources, using its various zonal/field offices, maintain a total number of 130 hydrological stations nation-wide. Most of these stations were established under consultancy agreement with some engineering firms while others came up with the technical assistance of WMO as in Niger Basin and Benin-Owena Basin while 18 Nos Telemetric hydrological stations have been incorporated under the WMO/NBA Hydro Niger Project.

The Federal Department of Meteorological Services operates a network of meteorological stations. Hydrometeorological stations network are also maintained by other afore-mentioned agencies. It is the intention of FMWR to achieve the minimum of Operational Hydrology Programme with WMO Guidelines. The co-ordination of the harmonisation of Operational Hydrology Programme by the Ministry nation-wide strives to pool resources and standardise hydrological practices and procedures and hence avoid duplication of efforts.

2.3.1 Telemetric (Real-Time) Hydrological Network Programme - Hydro Niger Project

The Hydro Niger Project which is being implemented under the aegis of the Niger Basin Authority (NBA) with the World Meteorological Organisation (WMO) as technical executing agency, is a telemetric hydrological network of monitoring the flow of Niger drainage system (including the Benue) at 65 different locations across the entire River Niger Drainage basin sub-region (which covers up to 70% of the hydrological drainage basins in Nigeria) which are as follows:

-	Nigeria	18 DCPs
-	Niger Republic	9 DCPs
-	Benin Republic	2 "
-	Cote D'Ivoire	2 "
-	Cameroon	5 "
-	Burkina Faso	1 DCP
-	Guinea	7 DCPs
-	Mali	21 "

2.3.2 Hydro Niger Project Data Collection - Platforms DCPs in Nigeria

<u>S/No.</u>	<u>Name of Station DCP</u>	<u>River</u>
1	Kende	Sokoto
2	Jidere Bode	Niger
3	Kainji Tail-race	Niger
4	Kainji Reservoir	Niger

2.3.3 Experimental Basin Programme

This is a programme aimed at developing experimental watershed or research basins in order to improve the understanding of complex hydrological processes in a humid tropical environment like Nigeria. Two pilot projects have been identified. One in Ogun-Oshun basin to represent tropical rain-forest region and the other within Kaduna basin as a representative of a semi-arid environment.

2.3.4 Sediment Transport Programme

This programme was initiated in 1985 under an NBA/USAID/COE Sediment data collection project for the Niger Basin. So far, reconnaissance assessment of four (4) sediment sampling stations has been undertaken at Yola, Ibi, Umaisha and Onitsha. The project will resume when the administrative problems within the NBA are resolved. As part of the means to enhance planning, operation and management of hydrological programmes, a technical committee known as Nigeria National Committee for UNESCO-International Hydrological Programme (IHP) was set up and co-ordinated by the FMWR. Experts are drawn from the following establishments:

- Federal Ministry of Water Resources	3
- Federal Department of Meteorology	2
- Federal Inland Waterways Department	1
- Federal Ministry of Science and Technology	1
- River Basin Development Authorities	3
- State Water Boards	2
- Universities and Higher Institutions	2
- Hydrological Sciences Association of Nigeria	1
- Nigerian Association of Hydrogeologists	1
- Nigerian National Commission for UNESCO	1

2.3.5 Hydrology and Water Resources Programme (HWRP) of World Meteorological Organisation (WMO)

The Hydrology and Water Resources Programme (HWRP) is one of the five (5) major technical and scientific programmes of WMO. The efforts of HWRP is geared towards promotion of world-wide co-operation in the evaluation of Water Resources as follows:

- In the development of water resources through the co-ordinated establishment of hydrological networks and services including data collection and processing.

- Hydrological Forecasting
- Supply of Meteorological and Hydrological data for design purposes.

Nigeria is fully committed to the goals of the HWRP

2.3.6 Sub-Saharan Hydrological Assessment

Nigeria is participating in the Sub-Saharan Hydrological Assessment financed by the World Bank, UNDP, ADP and the French Government. The programme is to assess the adequacy or otherwise of the Hydrological network in the sub-region with a view to identifying gaps and making recommendations for filling the gaps. The ultimate objective is to assist participating countries in the creation and improvement of a sound hydrometric base for purposes of planning and evaluating water resources development programmes.

Messrs Mott Macdonalds and Enplan (Nigeria) Limited have been appointed by the World Bank to carry out this exercise for Nigeria. The project commenced in Nigeria in April 1991.

2.4 **Establishment of Water Resources Data Bank**

Realising the quantum of data that the Ministry collects, stores, analyses and disseminates, and the cumbersome traditional data processing, it became necessary to resort to the use of modern and faster method of doing this - through the use of computers. Assistance was sought in 1985 for the establishment of a computer based water resources management information system, training both executive and support manpower personnel and establishing hydrometric control station for standardisation, reliability and validation of data from various sources. An agreement was signed in 1989 with the United Nations Department for Technical Cooperation for Development (UNDTCD) and the project became operative in July 1989 with the first mission of the UNDP Consultant. With this start, already a water resources data centre has been well established in Enugu and Maiduguri.

Each RBDA also has a set of computers to enhance computer based water resources management information system. Staff of the Ministry, RBDAs and other water resources agencies are being trained so that they can operate the system effectively.

For compatibility, the Water Resources Databank Centre also maintains a link with the National Water Resources Institute Data Bank, Agric. Sectoral Data Bank as well as the National Databank, the latter under the Ministry of Finance and Economic Development.

2.5 National Water Resources Master Plan

The basic objective of the Nigeria Water Resources Master Plan is to prepare a comprehensive and up-to-date plan for the maximum development and use of the water and related land resources of the country. It is to provide a financially and economically sound investment options in water resources development to achieve accelerated and sustained growth in agricultural production and to ensure efficient and sufficient potable water delivery. The resources inventory to be made will facilitate project identification and preparation under successive long-term and short-term development plans of the country. The plan would provide a framework for project selection, planning and investment decisions.

Primary consideration is to be given to irrigated agriculture in the dry season, potable water supply and sanitation, and improved water control and management in the rainy season. Consideration will also be given to other important uses of water, including salinity control, inland water transport, fisheries, industrial use of water and flood protection/mitigation for urban areas, rural settlements, communications and transport. The activities for the preparation of the masterplan started in 1984 with the FAO assistance. A draft water resources masterplan report with its investment options was submitted in 1985. The report estimated the country's surface water potential at about 224 billion cubic metres, out of which potentials for irrigation, navigation, water supply, hydropower etc. were also estimated. Further work still needs to be done to fill in the gaps with data. Assistance is being sought from international organisations. In recent times, discussions were held with the World Bank and JICA (Japan International Co-operation Agency) on possible areas of co-operation.

2.6 Regional, Bilateral and Multilateral Relations

Nigeria shares her major rivers and lakes particularly Rivers Niger, Benue Cross and Lake Chad with other neighbouring countries.

In order to ensure the rational use of these rivers and lakes and derive maximum economic benefit and protect the investments that depend on these rivers, Nigeria participates very actively in regional bodies formed by the riparian States in which she is a member. Such bodies include:

- Niger Basin Authority (NBA) made up of nine members that share the waters of the River Niger.
- Lake Chad Basin Commission made up of four member States that share the waters of Lake Chad.

- Nigeria/Niger Joint Commission (NNJC) - a bilateral relation with Niger Republic and the headquarters is in Niamey.

At present, four common projects are being executed by both countries under the auspices of NNJC Secretariat. The four projects are:

- (i) Studies for the conveyance of water from Zongo dam in Niger to Lake Kalmalo in Nigeria.
- (ii) Studies for the conveyance of water from Jibiya Dam into Niger Republic to recharge the Goulbi of Maradi Aquifer who reduction was seriously affecting the farming activities in Niger Republic.
- (iii) Construction of two channels in Hadejia River to reduce run-off losses in the Komadougou Yobe Basin.
- (iv) Construction of water sharing structure on the komadougou-Yobe River close to its opening in Lake Chad.

2.7 National Water Resources Decree (NWRD)

The decree was drafted and submitted to the Council of Ministers in February 1988 for consideration and approval and subsequently for promulgation. By Council Conclusion 12(6&7) of 10th and 11th February 1988, Federal Ministry of Justice was directed to draft the final decree, after inputs must have been received from interested parties. The draft is awaiting promulgation.

2.8 The National Council on Water Resources

The National Council on Water Resources (NCWR) is the highest policy making body for water resources development in Nigeria. The Council is chaired by the Honourable Minister of Water Resources. It has State Commissioners in charge of Water Resources, Chairman DFRRRI and Chairman Water Resources Agency (Federal Capital Territory) as members.

It was first inaugurated in 1980 and functioning well, until 1983 when it ceased largely due to the merging of the then Ministry of Water Resources with the erstwhile Federal Ministry of Agriculture, Water Resources and Rural Development, which had another parallel National Council on Agriculture.

However, this Administration realises the dominant and useful role water resources plays in the nation's development for an enhancement of effective policy formulation, therefore, the National Council on Water Resources was resuscitated in 1987. Since then, all the States of the Federation including Federal Capital Territory (FCT) have been cooperating with the Ministry; the Commissioners for Water Resources or Commissioners responsible for water resources development have been representing their state governments at the regular council meetings.

The result of this Council meeting is the formulation of policies for the current aggressive water resources development all over the country.

2.8.1 National Technical Committee on Water Resources

Its role is advisory to the National Council on Water Resources (NCWR). It has the Director-General of the Ministry as the Chairman while Chief Executives of Water Resources Agencies (Water Boards, NEPA, RBDAs, Inland Waterways, ADPs etc.) all over the country are members. The following are the sub-committee:

- Sub-committee on Hydrology and Hydrogeology
- Sub-committee on Irrigation and Drainage
- Sub-committee on Manpower
- Sub-committee on Dams
- Sub-committee on Water Supply and Sanitation
- Sub-committee on Erosion and Flood Control

These Sub-committees meet regularly to discuss and exchange ideas on pressing problems of water resources development and its further promotion. These Sub-committees often set up working groups to carry out field studies and submit recommendations.

2.9 Programme Requiring Assistance

Water Quality Monitoring

The project was initiated as a result of the growing concern for water pollution, supply of not-so-well treated water to Nigerian consumers by State Water Authorities and the need to safe-guard the lives of all Nigerian depending directly or indirectly on our natural sources of water.

As a result of this, the National Sub-Committee on Water Supply and Sanitation in 1985 set up a working group to study the possibility of establishing water quality laboratories in Nigeria.

The working group came up with the recommendation that four (4) regional water quality laboratories be established at Enugu, Akure, Minna and Dadin Kowa and two (2) reference/research laboratories be set up in Lagos and Kaduna. Assistance is needed to acquire the needed equipment and chemicals to equip the 6 laboratories and to commence Quality monitoring exercise. The requirement is estimated at \$15m.

Other projects conceived to generate baseline data are as follows:

- Monitoring of Water quality of Kaduna River which is around an Industrial town was carried out in 1984.
- Monitoring of Water quality on Nigerian Coast lines was initiated to ascertain influences of industrial activities in the water sources. Two Universities: University of Benin and Obafemi Awolowo University (OAU) were selected to carry out the study. The total cost of the study is estimated to be N3.0m.

3.0 PROTECTION OF WATER RESOURCES, WATER QUALITY AND AQUATIC ECOSYSTEM

3.1 Dams - Construction & Development

Nigeria is the natural outlet of two major drainage basins in the West Central African sub-region; Niger Basin, and Cross River Basin. These two basins combined, stretch from Guinea and Mali in the West to Cameroon in the East. On the other hand, the country contributes run off into Lake Chad situated within an extensive inland drainage basin shared by Nigeria and many countries including Niger, Chad, Cameroon and Central Africa. The water resources of Nigeria therefore derive from both external and internal sources.

The three international rivers; the Niger, Benue and Cross River and their numerous tributaries draining the whole country provide ample sites for the construction of dams for all purposes. The first major effort to construct a dam in Nigeria was in the early sixties and was for hydroelectric development.

The Kainji Dam can be said to be the oldest large Dam in the country which apart from its major function had provisions for improvement of navigation and some irrigation, fisheries and recreation. It was the first multi-purpose Dam. It was also built on the River Niger, an international river.

The decades of the seventies and eighties witnessed a proliferation of dams of all capacities and for a variety of purposes.

Dams were constructed for irrigation, water supply, flood control, hydro-electric power development and for livestock use. Most of the major dams are owned by the Federal Government and are consequently under the care of the Ministry of Water Resources.

Nigeria, the most populous country in Africa, has witnessed the doubling of its population in 2 decades and is faced with the enormous responsibility of feeding its people as a matter of National Security and dignity. Water in vast quantities is therefore required all year round to cater for industrial, domestic, agricultural and various other demands. Vast land available has to be irrigated and as many rivers adjoining these lands are not perennial, dams have to be constructed.

These completed small dams are storing 24.25 million cubic metres and are providing relief to many small communities in terms of water supply, small irrigation schemes and livestock support. Eleven small dams currently under construction will bring up the total storage by end of next year to more than 50mcm.

3.2 Rehabilitation of Dams

Side by side with the construction of new dams, the rehabilitation of older dams and normal maintenance are being looked into. A programme is now under way to finalise in great details the National Inventory of Dams and to set up a detailed investigation on needs for rehabilitation of affected structures. When all aspects of work are quantified, it will be sorted out as to which ones can be done in-house or through competent contractors.

3.3 Safety Aspects of Dams

The rehabilitation of all structures will contribute greatly towards safety by several other measures will also be taken. Such provisions as instrumentation, continuous monitoring and telemetric alarm system will form a package of measures to provide the capability to know very quickly the state of affairs of all structures and how to respond to any given situation.

Furthermore, safety aspects not only for the structures but more importantly for the people down stream of the dams will be taken into account in all respects. Dam break studies will be carried out and as a precautionary measure, likely areas to be affected, in the event of a break, will be properly mapped out and as far as possible depopulated.

In the case of new dams, the study will be part and parcel of the overall investigations and design and the measures to be taken will be included in the cost of the project.

3.4 Control on Environmental Impacts

When dams are constructed and reservoirs created, several issues relating to the environment manifest themselves. In the first instance a large area of land is submerged and more often than not a large number of people are affected. Similarly animals and birds in their natural habitat are also displaced. Whereas interaction and prior dialogue with people affected can lead to settlement with a little or no adverse psychological set backs, the issue of those beings in the lower animal kingdom has to be approached with utmost care. Complete disregard of this latter concern could lead to irreparable damage to the fauna and flora of a given area in the delicately balanced environment.

Storage of large bodies of water which for most times remain stagnant provide a haven for the breeding of disease carrying insects and parasites that use water as a medium in their life cycle. Several water related diseases might manifest themselves in the communities that live in the immediate vicinities of such reservoirs. It is known that only lakes which cover a surface area of 10,000 Ha and above are affected by the earth's rotation and therefore do get the benefit of this motion to keep the water in not so stagnant a state. A lot of our reservoirs command much less areas.

Four areas of concern have to be considered

- 1 The displacement of people and their resettlement taking into account their customs and socio-economic life.
- 2 The protection of Fauna and Flora
- 3 Controlling the spread of new diseases and containing those that exists in the project area.
- 4 Making good all areas exposed to heavy machinery activity after construction in order to check further deterioration giving way to erosion and gully formation especially down-stream of a reservoir.

The last issue enumerated above is straight forward Civil Engineering endeavour. One good example worth emulating is the way some European countryside have been turned into a very pleasant green rolling plains after the ravages of mining activity.

Recently, there is a global awareness for the protection of the environment and all projects the world over especially World Bank funded take into account the environmental impact. The first 3 issues enumerated form the human and therefore the most delicate aspect of the environmental issue.

The Department of Dams and Reservoir Operations of the Federal Ministry of Water Resources is devoting one of its sections to work on environmental issues. This section is being staffed with social workers, community health officers, parasitologists and restoration experts. This section will be in the forefront in any studies for a new project so that harmony reigns at the end of its final execution.

3.5 Dams on International Rivers

The major Rivers that drain most of the country are all international rivers and therefore can be exploited upstream by other Nations. Activities outside our borders can therefore adversely affect the capacity utilisation of our structures built on these rivers. Already Nigeria is feeling the pinch of the effect of the activities upstream of the River Niger and is very worried about the impact the proposed Kandadji Dam will have on our hydro-electric Dams at Kainji and Jebba. Prevention of in-flow is one problem as in the case of the River Niger, but uncontrolled release of water from Ladgo Dam in the Cameroons poses a different danger of sudden floods in the Benue Valley. Furthermore there is a natural problem presented by Lake Nyos still in the Cameroons. A natural reservoir created in the crater of a volcano has impounded 182mcm of water high up in the mountains. Any eruption of the volcano will send down this water into the Benue Valley with devastating consequences. These issues require bilateral discussions understanding and co-operation from our neighbours. However, while these will be followed through diplomatic channels, studies for all three problems are under way.

- 1 Impact assessment studies from the effect of Kandadji Dam in Niger Republic.
- 2 Flood Control Studies from uncontrolled releases from Ladgo Dam in Cameroon.
- 3 Lake Nyos studies to avert disaster in the event of the volcanic eruption on mount Cameroon. These studies will simulate the flow pattern of the water at various stages as it enters Nigeria and propose a set of measures to contain the flood.

3.6 International Commission on Large Dams (ICOLD)

Nigeria is an active member of the International Commission on Large Dams. The activities of the ICOLD relates to such issues as multi-national issues raised above. The country is particularly happy about the work done by the sub-committees on "Shared Rivers" and "Siltation of Reservoirs" Reports presented at the recently concluded Congress in Vienna.

We endorse the decision of ICOLD to conclude its work on the issue of shared rivers and pass this on to an appropriate body of the UN for policy formulation.

3.7 National Sub-Committee On Dams (NSCD)

The National Sub-Committee on Dams (NSCD) is one of the five working committees set up under the National Technical Committee on Water Reservoir to the National Council on Water Resources.

3.8 Programme For Assistance

In order to have a bright future, the present must be well taken care of. Our immediate concern will be to protect our investments in already constructed Dams by ensuring prompt rehabilitation and continuous maintenance.

Next, we have to lay emphasis on training so that adequate skilled manpower is available to look after our structures and to participate in all stages of investigation, design and execution of projects. Emphasis will be laid in producing engineers and technicians versed in Geotechnical. Environmental hydraulics and electro-mechanical fields relating to dam technology.

With what we are experiencing upstream of our shared Rivers our attention will be focused on protection of Dams on our internal rivers for maximum security to our Nation and our investments.

The possibilities of providing drought reservoirs will also be examined. These reservoirs will be sited within the latitudes or vicinity of the drought prone zones and will serve a dual purpose.

- (a) To be put into use its conveyance to deliver water to various communities in the event of drought.
- (b) To otherwise be useful in topping up moisture content in the air and enhance more rainfall and consequently be a check against further desertification.

Finally, as we are members of the global community, we shall actively participate in finding the 'Human solution, where man-oriented macro planning could exist in a region which will identify and emphasize areas of common, over riding interest and for once will look beyond national and international political boundaries and integrate all activities under a common package for survival.

3.9 Establishment of Water Quality Monitoring Network

Arrangements are well under way for the overhauling of Water Quality Monitoring System in the country by the FMWR and would be working mainly on the two major rivers of Niger and Benue.

This project which is conceived in 1991 has already identified nine quality assessment points on the rivers Niger, Benue, their tributaries, and the Niger down to the Delta. The identified points are as follows:-

- 1 Lollo, Malade, Mureji on the river Niger before the confluence
- 2 Wuro Bokki, Numan, Nyansando on river Benue.
- 3 Dindima on River Gongola
- 4 Idah, Ndoni on Niger down to Delta.

The monitoring is expected to be carried out by the staff of the Ministry but presently efforts are geared towards rehabilitating some of the Ministry's test kits and acquiring new ones. Necessary contacts have been made with relevant agencies to establish logistics for take off of the project.

4.0 DRINKING WATER SUPPLY AND SANITATION

4.1 Situation Report

Prior to 1976 when the Department of Water Resources became functional Water Supply responsibility was handled by individual State Water Agencies, Local Government Areas and in some cases Federal Ministry of Works. Sanitation received little or no attention and was nobody's responsibility until the Rapid Assessment Programme of 1977-79 focused on these problems.

4.2 Advancement in Water Supply Management

The Department of Water Resources of the Federal Ministry of Water Resources originally had two (2) basic divisions from inception - namely Hydrology/Hydrogeology and Water Supply/Irrigation. A Water Supply/Sanitation and consequently Water Supply/Quality Control division emerged in 1985 when the division of Irrigation/Drainage was created. The Division of Water Supply and Quality Control at inception inherited little or no projects. However, between 1977 - 1979 it was involved in carrying out a Rapid Assessment Programme on Water Supply and Sanitation in Nigeria in conjunction with Federal Ministry of Health and UNICEF.

The Rapid Assessment Programme (RAD) provided some of the information needed for the preparation of the Nigeria Country Report for the International Drinking Water Supply and Sanitation Decade (IDWSSD) programme which was eventually launched in November, 1980. As a means of realising the aims of the IDWSSD, over 1,000 boreholes were drilled in all the States of the Federation plus FCT between 1981 and 1983.

In 1984 the World Bank prepared a water supply and sanitation sector memorandum based on its perception of the country's water supply and sanitation situation. This document was reviewed by the Department and subsequently by the National Sub-Committee on Water Supply and Sanitation, formed in 1981 as one of the five sub-committees under the National Technical Committee on Water Resources (NTCWR) of the National Council on Water Resources. This document is one of the stages for the sectoral lending programme for Nigeria which the World Bank proposed in the process of preparing for the National Water Rehabilitation Fund Project. Another sector memorandum on rural water supply was also prepared by the World Bank in 1986. In 1988 a Rehabilitation Needs Study was prepared for urban water supply.

In 1990 a Rural Water Supply Sector Strategy and Action Plan was prepared jointly by the World Bank and the Ministry while in 1991, the Ministry prepared a rural water supply situation report.

4.3 Various Programmes, Achievements and Future Plans

The Rapid Assessment Programme of 1977 - 79 and the World Bank Water Supply and Sanitation Sector Memorandum of 1984 provided the sources for basic information for the systematic development of policies and programmes for the Water Supply Sector. Various projects and programmes were thus developed to tackle the problems of urban/semi-urban water supply on the one hand, and rural water supply and sanitation on the other.

4.4 Rural Water Supply & Sanitation Sector Strategy & Action Plan

As part of the discussions between FMWR, FMFED and the World Bank, a Water Supply Sector Memorandum was prepared in 1984 by the World Bank and was discussed extensively by the Sub-Committee on Water Supply & Sanitation and later by the National Technical Committee on Water Resources. As per the final document, it was agreed that a special study be carried out for Rural Water Supply & Sanitation. The special study was executed by a World Bank Consultant and staff of FMWR after which a Sector Memorandum on Rural Water Supply and Sanitation was produced in 1986.

This document focused on the institutional arrangements for the sector, and its major recommendation was the handling of the sector by the Local Government Authorities.

An up-date of the above document is now under preparation. This is called Rural Water Supply & Sanitation Action Plan & Strategy of which the draft final report is to be discussed in August, 1991 at a national seminar.

The final document to come out of the workshop would now form the basis for rural water supply and sanitation development in the country.

4.5 Rural Water Supply for Improvement of Health in the Rural Communities

Part of the recommendations in the Rural Water Supply and Sanitation Strategy and Action Plan involves institutional changes to place the responsibility of rural water supply squarely on the shoulder of the Local Government Authorities.

This would place the responsibilities with the appropriate authorities who are close to the grass-roots and are better placed to respond effectively to the Water Supply needs of rural communities once they are provided with the expertise and funding to handle this aspect of work.

The Department of Water Supply and Quality Control has recently prepared a document "Rural Water Supply for a Healthier Nigeria" which seeks Federal Government intervention in establishing rural water supply units in each Local Government Authority in the Federation. The functions of these units are to construct water points in solid co-operation and consultation with benefiting communities and to train them in the proper operation of the water points and simple maintenance procedures. They would also assist in the training of local mechanics to carry out minor repairs of the hand-pumps or simple water supply devices installed.

4.6 Multi-State ADP: Rural Water Supply Component

The Multi-State Agricultural Development Project (MSADP) being financed through a World Bank Loan is involved in improved agriculture in all areas of the country. The project therefore has substantial rural water supply component. Due to this, the erstwhile FDWR was invited to participate on the feasibility study on this component of the project.

The project study commenced in 1988 under the funding of the World Bank. Among the objectives of the study was the determination of ADP investment programming for water supply in Akwa Ibom, Anambra, Bendel, Benue, Cross River, Ogun and Plateau States. It was also to identify viable rural water sources that can be developed and identification of pilot projects for rain harvesting and infiltration galleries. The final report was submitted in December, 1989.

4.7 Rainwater Harvesting System

The Department in co-operation with DFFRI completed the design of a Rainwater Harvesting system, with the use of roof catchment gutters and tanks.

The fabrication of the prototypes were completed in 1988 and the prototypes distributed to some States.

Water collected with the rain harvesting system during the period of heavy rainfall will serve as an alternative means of providing water supply to small communities where probably the hydrogeological conditions, terrain and finance make it impossible to exploit ground and surface water sources.

4.8 Exploration for Ground-Water in Sokoto State

With the assistance of Japan International Co-operation Agency (JICA), the Ministry has carried out water supply exploration studies in 21 towns and villages in Sokoto State. Future development is the construction of the schemes proposed for the 20 other villages through JICA assistance.

4.9 Nation-Wide Borehole Inventory

This project which commenced and was completed in 1990 was aimed at up-dating the existing information borehole drilling activities throughout the country. The information collected during the exercise is still being analysed by the Data Bank Unit.

4.10 Borehole Drilling

National Borehole Programme

Before the advent of this administration, 1,030 boreholes had been put in place nation-wide at a total cost of N41,285,155. Out of these boreholes, 860 were productive. Subsequent contracts were awarded for the erection of 25,000 gallon (114m³) overhead tanks on 3m high towers, generators of various sizes, submersible pumps of various capacities and generator houses at a total cost of N82.78m while only N46.1m was paid out for completed works.

Before handing over the projects to the River Basin Development Authorities (RBDA's), 120 out of the 860 productive boreholes had been completed in 1985. Between 1985 and 1988, the RBDA's completed a total number of 162 boreholes at cost of N20.43m. In 1988, the Ministry took over the projects once more and awarded contracts for the completion of 261 numbers out of the remaining 478 boreholes at a contract sum of N17.17m. To date, 221 of these boreholes have been completed and commissioned while others are awaiting commissioning. This brings the total number of boreholes so far completed to 503 out of which 383 was during the present administration. Towards the completion/rehabilitation of the uncompleted one, the Ministry has procured 120 15KVA Lister generators and 50 Grunfos submersible pumps.

5.0 WATER AND SUSTAINABLE URBAN DEVELOPMENT NATIONAL WATER REHABILITATION PROJECT

It is the statutory responsibility of State Governments to provide safe water supply to the urban, semi-urban and rural populace of this country. Though over the past three decades, most States have made substantial investments in urban water supply, the result have often been disappointing. Few consumers receive satisfactory supply due basically to existence of major operational and financial problems compounded by insufficient number of qualified and too many unqualified staff. This ultimately led to the inability of State Water Agencies (SWAs) to maintain the installed plants and equipment and as a result, most facilities fell below their design capacities. Presently, only about 60% of Nigeria's urban population and less than 20% of rural population are provided with safe water supply.

Faced with these unhappy situation, many State Governments approached the World Bank to borrow funds to rehabilitate their water supply systems. This led in 1979, to the Federal Ministry of Finance (FMF) making contact with the then Federal Ministry of Water Resources (FMWR) to point out the need to address the many requests from the State Governments. At a subsequent meeting the same year between the FMF, FMWR and the World Bank, the FMWR and the World Bank agreed that the FMWR should provide centralised co-ordination and policy guidance for the development of the sector, including guidance in the area of water supply management. As a result, the preparation of the National Water Rehabilitation Fund Project was initiated in 1984.

5.1 Project Objective

The objective of this project is to improve the level of water supply service in selected urban and semi-urban areas by meeting the highest priority rehabilitation needs and begin to address the major institutional weakness of the State Water Agencies in order to improve their capacity to efficiently operate and maintain water supply system.

5.2 Project Cost

The National Water Rehabilitation Fund (NWRP) would provide loan financing up to US\$Eq 10 million per State/FCT which would be complemented by US\$1.8 million on counter funds to be provided by each State.

Detailed engineering design, construction, supervision and overall project co-ordination would be financed under a loan of US\$36 million to Federal Department of Water Supply and Quality Control with local costs of USEq 7.4 million. The project total costs are estimated at US\$Eq. 306.7 million.

5.3 Activities so far

The Sector Memorandum On Water Supply and Sanitation that looked into the needs of the entire sector was completed in 1984. The Memorandum identified areas that needed studies and strengthening. This led to other activities in the sector.

5.4 Manpower Seminar

One area of deficiency recognised was manpower availability in the Water Supply and Sanitation Sector. A preliminary survey was carried out and a Manpower Seminar held in Jos 1985, the outcome of which included the recommendation to plan and carry out Human Resources Development for the sector.

5.5 Rehabilitation Needs Study

A review and identification of the rehabilitation needs of the equipment and materials in the urban water supply systems in all 21 States and FCT, including recommendations for improvement in accounting, manpower development and training of personnel for the water supply sector has been carried out. This study awarded to Messrs Diyam/Binnie Consultants was first completed in 1988.

The final report which contain the engineering details and costs and which now forms the basis for the rehabilitation works to be carried out nationwide was also completed by the Consultants in April, 1990.

5.6 Multi-State Water Supply Programme

Realising that the provisions under National Water Rehabilitation Fund Project would not fully satisfy the needs of the States especially in the area of expansion of existing water schemes or provision of new ones. The FMWR had, on the directive of the World Bank, treated the States requiring such loans in groups of twos and threes.

The Multi-State Water Supply Programme was then instituted to take care of the States Water Supply expansion needs.

Based on the level of their preparedness, in terms of project preparation, the World Bank has grouped the affected States as Multi-State Water Supply Project I & II (MSWSPI and MSWSP II). The MSWSPI for the first two states of Kaduna and Katsina have been negotiated while the MSWSP II is still at the study stage.

5.7 Local Manufacture of Water Supply Chemicals and Equipment

In 1981, the National Council on Water Resources (NCWR), concerned with the problems affecting water supply in Nigeria, mandated the Sub-Committee on Water Supply and Sanitation to prepare a Water Supply Inadequacy Report. This report was produced and presented to the NCWR at its meeting held in Sokoto in February, 1982. Amongst the causes of inadequacy identified by the report was the little or no local manufacturing systems in Nigeria for the commonly used water supply treatment chemicals and equipment needed in the water industry. Based on this, studies were carried out and local manufacturing activities are being enhanced as specified under the following projects:-

5.8 Studies on Production of Water Chemicals

The feasibility study on the production of lime completed. Identification of possible manufacturers and provision of technical assistance to them to produce lime within the country now takes the front burner with the acquisition of personnel.

A further feasibility study on the possibility of producing other treatment chemicals was carried out in 1986 by staff of Ministry and a World Health Organization (WHO) Consultant. The study was meant to highlight sources of raw materials, estimated reserves, potential for their mining, technologies available for their extraction and their economic viability. The chemicals studied for were:

- Aluminium sulphate
- Chlorine
- Calcium hypochlorite
- Sodium hypochlorite
- Sodium carbonate
- Copper sulphate
- Activated silica
- Calcium hydroxide
- Sodium hydroxide

The sub-committee on Water Supply and Sanitation which is made up of General Managers of all the States Water Agencies in the country decided to set up a working group of five persons to assess the Terms of Reference prepared by WHO and make recommendations. The group has already produced a report which gave the quantities of the different chemicals required by water agencies up to the year 2000.

When the pre-feasibility study was completed it identified the need for a more detailed study on Kaoline (possible source of alum) and Brine (possible source of chlorine). Proposals were called for and the study costed but funds have not been to carry out the study. It is estimated that \$1.00 million would be required for this study.

5.9 Monitoring of Externally Funded State Water Supply Projects

Some States have, due to their peculiar problems, taken external loans from the World Bank to improve the water situation in their States. These States include Kaduna, Anambra, Borno and Lagos and the projects/loans are guaranteed by the Federal Government. The Ministry of Water Resources is involved from the project inception through negotiation to the conclusion stages through the Department of Water Supply and Quality Control which monitors project implementation and advises the Government as appropriate. The activities of the Dept. in this area is stalled by insufficient funds. External funding would help ensure proper monitoring of these projects which are predominantly state based. An annual budget of \$100,000.00 is estimated.

5.10 Programme for Assistance

(Water Supply Master Plan)

In order to set up a Water Supply Master Plan, the FDWR in 1984 invited six (6) Nigerian specialists in the field of Water Supply and gave them the assignment of preparing a draft Water Supply Master Plan. The work was completed same year and deliberated upon by the Sub-Committee on Water Supply and Sanitation and accepted.

The publication of the master plan was however withheld because of the desire by the then Department of Water Resources to incorporate the water supply master plan into the overall Water Resources Master Plan for the country.

Recently, as an outcome of the New Delhi meeting on the result of the International Drinking Water Supply and Sanitation Decade (IDWSSD) resolution on the intensification of efforts towards supply of potable water for all by the year 2000, the Water Supply Master Plan project was revived. Three (3) experts of the group of six (6) that prepared the draft document have been approached to review and up-date it for publication.

Financial constraint has barred the work on the review and up-date of the master plan from commencing. The estimated cost of the project is \$200,000.00. The assistance of donor Agencies and Governments will enable the early completion of this project that is so crucial for the establishment of the framework for planned development of water supply.

6.0 WATER FOR SUSTAINABLE FOOD PRODUCTION AND RURAL DEVELOPMENT

6.1 Rural Water Supply Project

The rural areas in Nigeria, have in the past been grossly neglected in infrastructural developments vis-a-vis rural water supply. This resulted in the provision of potable water to only about 20% of the rural population, i.e. those living in communities having population of less than 5,000 inhabitants.

Due to this deplorable state of affairs in the water supply sector, the Federal Government of Nigeria in 1979 started negotiation with the World Bank on how to improve the situation and ameliorate the sufferings of the rural community. This led to the preparation of a Rural Water Supply and Sanitation Sector Memorandum by the World Bank in conjunction with the then FDWR in 1986.

Also, Rural Water Supply and Sanitation Sector Strategy and Action Plans that contains strategies and plans to be adopted in improving water supply to the rural community was completed in 1991 by the UNDP/World Bank in association with the FMWR, DFRRI, FMoH and UNICEF. This document is scheduled to be discussed in a national Workshop in Abuja in March 1992.

6.2 Hand-pump Project

The Federal Government of Nigeria is participating in the global hand-pump programme being financed by the UNDP/World Bank. This programme was fully conceptualised and commenced in December 1986 in a pilot project in Missau Local Government Area of Bauchi State.

The overall objective of the pilot project is to develop programme guidelines and introduce hand-pumps for large scale sustainable rural water supplies in the country. Under the programme, 5 hand-pumps namely Ruwatsan, Indian Mark II, Indian Mark III, Afridev and Volanta were tested up to the middle of 1990. At the end of the testing period, the Technical Report produced recommended Ruwatsan and Afrider hand-pumps for wide-spread manufacture and use in the country. The two hand-pumps have been renamed Ruwatsan I & II respectively and are being manufactured locally by four companies.

6.3 Irrigation Development in Nigeria

For the effective utilization of Water for sustainable food production, a number of large scale irrigation schemes have been established in Nigeria. More are being established and more have been planned to enhance production of food and agricultural raw materials for our national self-reliance. In order to improve the performance of some of the irrigation schemes and hence derive maximum benefits from them, some studies have been commissioned to revamp the irrigation capacities. It is intended that in the future, the schemes will generate enough revenue to cover their operation and maintenance costs as well as recover part of their establishment costs. Nigeria is presently enjoying various assistance from the World Bank and African Development Bank for the identification, planning and development of major irrigation projects in the country.

6.4 Assistance to Drought-stricken States

The persistent drought which has ravaged some states of the Federation has received the attention of Federal Government of Nigeria. The drought relief programme is being implemented for the frontline States of Sokoto, Katsina, Kano and Borno and the buffer zone States of Jigawa, Taraba, Bauchi, Kaduna and Niger. Under the programme, each of the frontline States are benefitting from 25 boreholes while each of the buffer zone States would have 15 boreholes. Other organizations like UNDP/FAO are also assisting drought-stricken States through the provision of boreholes.

To improve water supply for sustainable food production and rural development, assistance are required from bilateral and multi-lateral donors in order to provide the required manpower training, equipment and materials for the sector.

7.0 IMPACTS OF CLIMATE CHANGE ON WATER RESOURCES

The changes in the climate of Nigeria as discussed earlier in this report have serious impact on the Water Resources of the country. Thus, soil erosion, floods, droughts and desertification are common occurrences. These natural phenomena are scourges that have negative impact on the nation's economy. Their devastation of agricultural, residential, industrial lands and related resources are common knowledge.

The Federal Government of Nigeria has mapped out special programmes to address the environmental issues in the following areas:

7.1 Inter-Basin Water Transfer Project

This project commenced in 1988 with the aim of improving the reliability of river flows in areas where severe drought conditions have occurred in the country. The Government has carried out pre-feasibility studies of the inter-basin Water Transfer of 5 major schemes under the Phase I of the project.

The phase II of the project has also commenced early this year involving the feasibility and detailed engineering design of one of the schemes.

7.2 Soil Erosion and Flood Control Projects

The Federal Government has spent over 1.1 billion Naira in soil erosion and flood control schemes nation-wide. Presently under the River Basin Development Authorities supervision, there are at least two approved and two on the waiting list soil erosion flood control projects in each State. In States where the problem is acute, the number of projects are as much as 17. In all, some 236 projects have been executed.