

**Master Plan of the Federal Ministry of Water Resources and Rural Development,
Federal Republic of Nigeria.**

**By
Japan International Cooperation Agency (JICA).**

THE STUDY ON THE NATIONAL WATER RESOURCES MASTER PLAN

Study Period: March 1992 to March 1995

ABSTRACT

1. Background

In Nigeria that is endowed with comparatively large reserves of the water resources, the nationwide water resources development came into existence in the 1970s in connection with the buoyant oil revenues and will be more promoted to meet an increasing water demand in various sectors. The Federal Ministry of Water Resources and rural Development initiated in 1984 the preparation of a National Water Resources Master Plan with FAO assistance, but a draft plan as submitted in 1985 did not compile all the issues sectorally and comprehensively, and the FAO assistance could not stretch further to address these issues for the lack of fund and others. Under this situation, the Federal Government of Nigeria made an official request to the Government of Japan for assistance in updating the original draft by addressing its shortcomings and drawing up a complete Plan.

Review of the water resources development and management so far conducted indicates that the policy has been favored with the implementation of large-scale development with little attention to the water operations throughout a river system and also with few concern with the benefit accrual from it; on the other, the Government concerned would be generally inactive in preparation of the water resources inventory and performance of the water administration as a whole. In addition, the recent stagnation in Government spending originated from a succession of the large fiscal and external payment imbalances combined with economic recession has caused the Government to meet difficulty in giving the priority for effective and meaningful water resources program.

2. Objectives.

The objective of the Study is to formulate a National Water Resources Master Plan which assures the optimum water resources use and provides the appropriate development scenarios on short (year 2000) – and long (year 2020) term basis in meeting the predicted social-economic demand for regions over a wide range of water activities including the quantitative and qualitative assessment of water resources potentials; the development and management of potential projects for water source works, irrigation and drainage, water supply and sanitation, and other related components such as hydropower generation, inland navigation and inland fisheries; the integrated management of surface and groundwater and rivers; the watershed management inclusive of gully disaster

control; the water-related environmental management; and the appropriate water administration.

3. The Study Area

The entire area of the Federal Republic of Nigeria which is administratively composed of 30 States and the Federal Capital Territory has been divided into eight Hydrological Areas and six Regions for the convenience of presenting the items relevant to the Plan in terms of watershed integrity and water actions being regional than local in scope. Current status of the water resources development and associated water use as evaluated are summarized in the attached table “Major Indicators in the Plan:.

4. The Master Plan

4.1 Basic Strategies.

Four strategies have been formulated putting the Plan targets on short-and long-term basis, respectively:

- (1) Enforcement of the 1993 Water Resources Decree:

The establishment of a series of the regulations needed for proper enforcement of the provisions in this Decree, and the organizational strengthening of related administration should be made as the Short-term target.

- (2) Consolidation of the Hydrological Observation Network and Continuous Monitoring:

Consolidating the network of observing the surface and groundwater behaviors and related management system which has paid little attention should be completed as the Short-term target.

- (3) Proper Operations and Management of Existing Water Resources Projects and Facilities:

To overcome a number of the problems identified, the Short-term target has been provided for the preparation of reservoir water operations rules, the organizational set-up of water users associations, the rehabilitation of defective and deteriorated facilities mainly due to the shortage of regular repair works, and the strengthening of operation and maintenance program for project works.

- (4) Completion of the Water Systems Downstream of Existing Reservoirs:

At present, there are many of the incomplete water use systems and facilities for irrigation and water supply downstream of the already constructed dams; thereby, the effort to accelerate the development of these water resources projects should be realized as the Short-term target. In this occasion, the items in the above paragraph (3) should be applied.

(5) Appropriate Implementation of New Water Resources Projects with the Priority Given to Small and Medium Size:

The Plan by 2020 has established a target area for an irrigated agriculture of 1.5×10^6 ha., a target access rate to the safe water supply at 80 percent of the predicted population (186×10^6). In addition to consolidating existing and on-going projects as mentioned above, the Plan calls for a drastic change from the large-scale oriented to the direction to implement a series of the proposed small and medium-scale multipurpose water resources projects to meet the water demand anticipated in various sectors with a particular emphasis upon the effective programs of decentralization, privatization and users participation to facilitate the greater participation and deeper involvement of local people concerned. And, the priority area should be shifted to the Middle Zone for irrigation and the Southern Zone for water supply being apart from the Northern Zone where main thrust is moving towards the promotion of more efficient water resources management programs. The JICA Team stresses that the experience and knowledge to be accumulated from positive implementation of the proposed small and medium ones for which the preparation should almost be completed by 2000 will be a great asset in complementing future development of the larger projects in more logical way.

4.2 Scope of the Projects and Service Levels Involved.

In accordance with the Strategies as mentioned above, the scope of the projects and related service levels involved in the Plan by 2020 is summarized in the attached table "Major Indicators in the Plan":

5. Financial Requirements for the Plan.

The costs required for implementation of the Plan are enumerated by the applying the price level of February 1994 taking into account the exclusion of uncertain inflation factors, and those for the public sector projects and programs are shown dividing into each five-year period by 2000:

(Unit: 10^6 Naira)

		1996~ 2000	2001~ 2005	2006~ 2010	2011~ 2015	2016~ 2020	Total
1	Water Resources Monitoring	270	250	230	240	250	1,240
2.	Water Source Works	800	7,300	9,400	10,900	13,300	41,700
	Rehabilitation and Improvement	600	-	-	-	-	600
	Proposed Multipurpose Dams	200	7,300	9,400	10,900	13,300	41,100
3	Public Irrigation and Drainage	7,780	7,580	6,450	7,690	8,930	38,430
	Rehabilitation and Improvement	7,680	3,100	-	-	-	10,780
	Proposed	100	4,480	6,450	7,690	8,930	27,650
4.	Water Supply	40,780	25,610	59,590	74,260	113,540	313,780

	Rehabilitation	3,400	5,160	21,020	10,050	13,260	52,890
	Proposed	37,380	20,450	35,130	49,050	67,820	209,830
	Reconstruction	-	-	3,430	15,160	32,460	51,050
5.	Dadin Kowa Hydro Dev., under NEPA	600	-	-	-	-	600
6.	Gully Restoration Works						
	Total (1.+2. +3).	8,850	15,130	16,080	18,830	22,480	81,370
	Total (1. ~ 6).						
	Total	53,890	80,740	75,690	93,090	136,020	399,410

The financial feasibility for the Plan which examines a comparison between the average annual costs required and the anticipated annual budgets as calculated based upon an annual real growth rate of three percent to the current budget inclusive of the State budgets and external loans concerned, reveals that apart from the sectors of water resources monitoring and irrigation and drainage, a huge budget would be required for the water supply component to meet the Basic Human Needs. If the budgetary arrangement during the Plan period is kept at present level without any extra expansion, it may be understood that the conditions for water supply in 2020 would be in a range of the service population rate of 60 to 70 percent for urban and 30 to 40 percent for rural.

(Unit: 10⁶ Naira)

		Average Annual Costs Required for the Plan –A-	Anticipated Annual Budgets During the Plan Period –B-	A / B
1	Water Resources Monitoring	0.005	0.036	0.2
2	Public Irrigation and Drainage	2.737	2.653	1.0
3	Water Supply	12.911	4.167	3.1
	Total (1. + 2.)	2.742	2.689	1.1
	Total: (1. + 2. + 3.)	15.653	6.856	2.3

6. Evaluation of the Plan

It may be judged that the projects and programs as incorporated in the Plan would be economically viable and environmentally sound when the remedial measures are properly taken.

6.1 Project Economic Justification.

The standard practice in terms of the economic rate of return (ERR) as is internationally applied has been employed by taking only the irrigated farming benefits for the evaluation of the public irrigation and drainage projects, indicating the ERRs of around 10 percent for the Northern region, 10 to 14 percent for the Central and more than 14 percent for the Southern. For the water supply sector, the least-cost approach has been taken resulting in the water rates chargeable per cu.m for recovery of 0M and replacement costs at 2 to 3 Naira for surface water and 2 to 4.5 Naira for groundwater; it may be considered that these rates would be in the acceptable range until users could attain a satisfactory level of income to bear the water rate for a full cost recovery.

6.2 Environmental Assessment.

The significant environmental problems have been addressed on regional and project basis including the drought and desertification; the imbalance between water resources potential and use due to improper development; the neglect of traditional water rights in wetlands; the increase of sediment, gully erosion disasters and urban flooding due to man-made watershed disturbance; the frequent occurrence of water-related diseases; the losses of fishery and wildlife resources; and so forth. The Plan calls for strict enforcement of the Environmental Impact Assessment (EIA) as an integral part of the water resources project cycle in line with the presentative of its procedures and guidelines as well as the urgent implementation of a proposed program on the EIA study and environmental monitoring for typical existing and proposed dams.

7. Recommendations.

Major recommendations for appropriate implementation of the Plan are given below while many suggestions and proposals are compiled in the Report:

- 1) To achieve a unitary administration and proper coordination for the enforcement of the 1993 Water Resources Decree, a competent Department of Water Administration should be created as a cornerstone of other operational Departments, the Ministry which is established in a form of enlarging and amalgamating the functions of existing Department of Hydrology and Hydrogeology that are not directly related to the public administration but to merely the technical oriented. It is also suggested to provide this Department with three Divisions such as (1) Water Use Coordination, (2) Hydrology and Hydrogeology (for Federal Administration) and (3) Environmental Management (for EIA and Watershed Management), and to strengthen the day-today regional water administration to be increased in work load with the establishment of four Regional Water Administration Offices. On the other hand, the technical responsibility of hydrology and hydrogeology should be concentrated in the National Water Resources Institute while strengthening the function of a National Water Resources Databank Centre and the budgetary arrangement to support the consolidation of hydrological observation network and continuous monitoring.
- 2) It is recommended to confine the responsibility of 12 River Basin Development Authorities that are presently being directed to operate as profit making commercial ventures under the 1988 Privatisation and Commercialization Decree into that for developing multipurpose water storages and conveying the raw water for the purpose of various sectors with the amount and timing needed by the downstream users at the designated points with appropriate cost arrangement, viz., the delivery point to Water Users Association for irrigation and to State Water Agency for water supply. In this respect, the cost allocation of multipurpose facilities should be put into practice. In addition, in view of the technical weakness in the State-run water resources projects, all of the water resources development even for small-scaled in the Plan

- should be operated by the Authorities until such time as the engineering capability of the States is substantially upgraded.
- 3) With the strict review that the continued decline in the performance of irrigated agriculture and the inadequacy of water supply systems have brought the current top-down approach under great scrutiny, it should be understood that the promotion of decentralization, privatization and users participation including the mobilization of social impact by women power in the water resources service area and the upgrading of users' water use technology and related efficiency be a key in achieving successful construction and sustainable management of the water resources project; therefore, it should be a pre-requisite to have the water users organize a functional water users association and request a project implementation to the Ministry in legal mode prior to the project formulation as well as participate in construction and subsequent management of the project through the Government's positive technical assistance and proper participatory arrangement. In addition, the institutional arrangement needs to be developed which would encourage the water-related Federal and State agencies to coordinate and establish mutually agreed upon priorities and policies for investment, regulation and allocation, especially for the management of river basins in term of water quality, human health and environmental consequences.
 - 4) It is stressed that severe shortage of the trained manpower in quantitative and qualitative term within the Water Resources Sector may be a major constraint of implementing the Plan in a feasible manner. The Plan has also identified that the transfer and development of appropriate water resources and environmental technologies are a long and painstaking venture by the Ministry which calls for a national water resources manpower training program by the external experts to assist the National Water Resources Institute in strengthening its manpower training scheme with "Action-Learning" or "Action – Research" approach in all technical and water administrative fields. Additional leading issue is that the primary one is incentives, motivation, dedication and accountability for all staff, but particularly for middle-class officials whose performance has the most decisive impact on institutional efficiency, while the senior managers need the innovation of their mind and consciousness.
 - 5) While there are more needs of the projects and programs to be assisted by international organizations or bilateral agencies where the study and preparation should be carried out upon setting clear guidelines in line with the internationally recognized standard, it is highly recommended that the top priority be given to prompt implementation of a feasibility study on the proposed Comprehensive River Basin Management Program in a particular basin with existing water resources development facilities as a pilot model for future demonstration and application to other basins. The Program intends to work out a realizable scenario on income generation and its sustainable development for the rural people's benefits through the establishment of a solid foundation for water resources development and

management and also the improvement of financial accountability and relevant extension services of autonomous utilities concerned through building the proper program management system.

- 6) It is advised that a supplemental survey of the National Water Resources Inventory which was presented during the course of the JICA Study should be promptly carried out upon overcoming the inherent defectiveness on database and inventory preparation in each Government agency, and also all of the database should be adequately incorporated into the National Water Resources Databank Centre. Moreover, the JICA Team suggests that the work to revise and upgrade the National Water Resources Master Plan as presented herewith shall be carried out every five year during its implementing period.

MAJOR INDICATORS IN NATIONAL WATER RESOURCES MASTER PLAN.

Region Hydrological Area	NW HA-I	NE HA-VII	CW HA-II	CE Has-III/IV	SW HA-VI	SE Has-VII	Total
1 Area (10 ⁶ sq.km)	131.6	188.0	158.1	231.9	100.5	113.7	923.8
2 Population (10 ⁶)							
-1991	10.3	16.8	10.5	9.7	22.3	18.9	88.5
-2020	17.0	28.2	25.3	24.4	49.3	41.8	186.0
-Growth Rate(% p.a)	1.74	1.80	3.08	3.23	2.77	2.77	2.59
3 Potential Water Resources							
3.1 Surface Water							
- Annual Yield (10 ⁹ cu.m)	22.4	8.2	32.6	83.0	35.4	85.7	267.3
- Specific Yield(mm p.a)	38	44	206	245	352	674	178
3.2 Groundwater							
- Annual Yield (10 ⁹ cu.m)	4.3	5.6	8.2	11.4	9.0	13.4	51.9
- Specific yield (mm p.a)	33	30	52	49	132	118	56
4 Existing Development							
4.1 Water Storages							
- No of Dams	20	23	32	35	32	18	160
-Active Capacity (10 ⁶ cu.m)	13,269	5,951	7,980	2,413	1,053	2	30,668
4.2 Irrigation & Drainage							
Public Service area (10 ³ ha)	8	27	12	12	3	8	70
Private: Service area(10 ³ ha)	35	98	10	3	0	4	150
4.3 Public Water Supply	(Per capita demand: 108 lcd for Urban and 40 lcd for Rural)						
-Urban: Service Population(%)	67	58	82	44	45	35	50
-Rural Services Population(%)	10	9	10	9	10	6	9
4.4 Water Use Rate							
- Surface Water (%)	2.1	14.6	1.1	0.3	0.8	0.2	1.0
- Ground water (%)	0.5	1.1	0.2	0.1	0.9	0.5	0.5
5. Proposed Development in the NWRMP							
5.1 Water Storages Newly Proposed							
- No. of Multipurpose Dams	64	20	304	362	141	193	1,084
- Active Capacity (10 ⁶ cu.m)	950	100	4,090	4,690	1,410	1,720	12,960
5.2 Irrigation and Drainage in 2020							
Public Service area (10 ³ ha)	120	95	305	305	115	180	1,120
Private: Service area(10 ³ ha)	75	190	40	45	10	20	380
5.3 Public Water Supply in 2020	(Per capital demand: 216 lcd for Urban and 80 lcd for Rural)						
-Service Population		80% for both of Urban and Rural					
No. of Boreholes(103)	36.96	59.23	38.43	49.68	44.70	57.80	286.80
Existing	4.16	5.23	3.03	2.88	3.10	3.00	21.40
Additional	32.8	54.0	35.4	46.8	41.6	54.8	265.4
5.4 Water Use Rate in 2020							
-Surface Water (%)	9.1	35.6	13.5	5.5	9.8	3.3	7.6
- Groundwater (%)	7.8	11.1	4.5	3.7	10.8	8.9	7.5
5.5 Capital Costs Required (10⁶ Naira)at 1994 Price Level							
-Water Resources Monitoring	154	188	187	214	224	273	1,240
-Water Storage	3,000	470	11,950	14,650	5,320	6,310	41,700
BMR	300	170	50	50	20	10	600
Proposed Multipurpose Dams	2,700	300	11,900	14,600	5,300	6,300	41,100
-Irrigation and Drainage	4,734	4,122	12,013	12,127	4,499	8,735	46,230
Public BMR	48	162	72	72	18	48	420
Public Proposed	3,802	2,738	10,043	9,923	3,922	7,582	38,010
Private Proposed	884	1,222	1,898	2,132	559	1,105	7,800
-Public Water Supply	25,940	45,360	39,690	36,740	100,920	5,130	313,780
BMR	5,230	8,440	7,080	5,970	16,590	9,580	52,890
Proposed	15,800	27,180	26,870	25,020	71,400	43,560	209,830
Reconstruction	4,910	9,740	5,740	5,750	12,930	11,990	51,060

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REGIONAL DIVISIONS

For the convenience of presenting the items relevant to the NWRMP to ensure that the watershed integrity is properly maintained and strengthened and the water resources are adequately managed with a concept that the actions should be regional rather than local in scope, Nigeria has been divided

into six Regions taking into account the principal geographical features and climatic-agroecological regions.

No	Region	Hydrological Area(HA)	States
1	North-West	HA I (Niger – North)	Kebbi, Sokoto, Katsina(3)
2	North – East	HA-VIII (Lake Chad)	Kano, Jigawa, Yobe, Borno, Bauchi (5)
3	Central West	HA-II (Niger-Central)	Niger, Kwara, Kaduna, Kogi, Abuja FCT(5)
4	Central East	HAs-III & IV (Upper Benue & Lower Benue	Adamawa, Taraba, Plateau, Benue (4)
5	South – West	HA-VI (Western Littoral)	Oyo, Ogun, Oshun, Lagos, Ondo, Edo Delta(7)
6	South – East.	Has-V & VII (Niger South & Eastern Littoral)	Anambra, Imo Rivers, Enugu, Abia, Akwa Ibom, Cross River(7)

Since the boundary of each Region does not always coincide with those of the States included, the areas included in HA-wise and State-Wise are compared:

No.	Region	Hydrological Area(HA) Area of the States					
		Area Include			(sq.km)	(sq.km)	%
		(sq.km)	(%)				
1	North-West	131.6	(14.2)	HA-I	131.6	129.3	(14.0)
2	North-East	188.0	(20.3)	HA-VIII	188.0	233.5	(25.3)
3	Central West	158.1	(17.1)	HA-II	158.1	187.2	(20.3)
4	Central East	231.9	(25.1)	HA-III HA-IV	158.9 73.0	181.4	(19.6)
5	South-West	100.5	(10.9)		100.5	115.0	(12.4)
6	South-East	113.7	(12.4)	HA-VI	53.9	77.4	(8.4)
				HA-V	59.8		
		923.8	(100.0)				(100.0)

Six Regions as demarcated above has the general relationship with other presentations as applied in various publications:

NWRMP Region	Agro-Ecological Zone	Climate Zone
North West North-East	Northern Grain Zone (Z-I)	Sudan Savanna
Central West Central East	Mixed Root Crop & Grain Zone (Z-II)	Guinea Savanna
South-West	Southern Tree and Root Zone (Z - III)	Rain Forest

It may be noted that aside from the above-designated regional divisions, the terms of “Northern Zone”, “Middle Zone” and “Southern Zone” are employed in this Report with respect to major strategies on the water resources management and development as examined in the NWRMP, and their boundaries do not coincide with those of regional divisions. For instance, the main strategy for the North Region is to strengthen the water resources management for existing water storages, but some of the sub-Hydrological Areas in its southern part are directed with the strategy on positive development of medium and small-size water resources projects. In the Middle Zone, the water resources

development in the NWRMP will be promoted with major emphasis upon public irrigation with supplemental role in public water supply, while that in the Southern Zone is vice versa.

Detailed Reports, in Five Volumes, available at the

**Federal Ministry of Water Resources .
Old Secretariat, Area One, Garki – Abuja, Nigeria.**