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Water Resource Management in the Niger Delta Region of Nigeria: The Role of Physical Planning

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Abstract

The Niger Delta region of Nigeria is naturally endowed with abundant natural resources especially water, oil and gas. Despite the availability of fresh water, the region has been struggling with acute potable water shortage since 1980s. Presently statistics show that water available to individual declined from 18.9litres in 1986 to less than 10litres per day among 50% of the urban population. To combat water shortage various governments within the region set up water corporations to manage this important resource. This paper studied the availability, accessibility and affordability of water in the light of the National water policy. The study employed various methodological approaches. Data on historical and traditional water management strategies were obtained from the national Archives and other water related public agencies. Information on water shortage and other water crisis issues were obtained. For the primary data, a household survey Questionnaire was structured to collect information on socio-economic characteristics of the respondents, availability and affordability of potable water. Using systematic sampling procedure twelve cities (Akwa Ibom and Cross River state) were sampled. A total of 400 households were selected based on household population of the areas. To ascertain potability of water, samples from identified sources were collected for bacteriological and physic-chemical test which were then compared with the water co operations and WHO standards. The study shows acute inadequacy of potable water due to administrative issues in the water management especially funds and equipment. To survive, the residents now depend almost entirely on streams/rivers

and boreholes. In order to strengthen water supply and make it affordable, the paper recommends the adoption of Integrated Water Resource Management.

Keywords: Water, resources management, Niger Delta, availability, affordability, physical planning

1.0 Introduction

Water is essential for both life and livelihood. Not only is it required for consumption by human and animal alike, it brings with it essential micro-nutrients such as iron and fluoride when supplied in the right quality. Water is required for such personal hygiene needs as washing as well as for agriculture and industrial development. Water is basic to man's existence on earth and any nation that fails to develop this vital resource, may be jeopardizing the health and socio-economic well-being of its people.

Although the vital role of safe water and sanitation in maintaining health has been recognized for centuries, many families, especially those in the developing countries do not have access to it. In Nigeria, rapid urbanization and government (National and State) incapacity to meet infrastructure provision have challenged various professional bodies. Cities exhibit intensive drinking water shortages since the oil boom of the 1970s. In 1996, the Federal Ministry of Water Resources observed that many cities in the country e.g. Kano, Aba, Port Harcourt, Ibadan, etc have water deficits of 66.7, 72.8, 44.1 and 68.7% respectively (Agbola, 2003).

The situation in the cities of the Niger Delta region is like any other across the country, and sometimes worse because of heavy pollution of its water sources due to oil exploration. For example Niger Delta Environmental survey (NDES) (2000) covering the region found out that most settlements depend on untreated surface water and wells, which result in health problems. It was estimated that only 45% and 40% (table 1) of the communities in urban and rural areas have access to safe drinking water. In a related study of the NDES (2004), it was found that the available quantity of water to residents which was less than 10 litres per person per day in 1994 had reduced to 5.5 litres per person per day in 2000. This shows that as the population increases there is a dramatic reduction in the quality and quantity of water available to the residents.

To increase safe water supply especially domestic in the country, the Federal government enacted a water policy in 2000 for the purpose of meeting the national economic target of improving from 40% in 2000 to 60% by the year 2003, expansion of service coverage to 80% of the population by 2007 and by 2011, 100% sustaining coverage. The urban and peri-urban water supply was to be 120 litres per capita per day with full reticulation and consumers' premises connection. The supply was to ensure good quality, affordability, free access for all and to monitor the performance of the sector for sound policy adjustment and development of water supply and sanitation (NWSP 2000). The WHO drinking water quality standard was to be the baseline for the National drinking water quality.

Based on the National Water Supply Policy (NWSP) (2000), this paper analyzed the emerging drinking water situation in the Niger Delta Region (NDR) and by implications Nigeria, a years after 2011. The paper is divided into sections including conceptual issues and literature review, the study area, research methods result and discussion and the conclusion.

2.0 Conceptual Issues and Literature Review

A dozen of African Nations are struggling to balance declining per capita water supplies with demands of rapidly rising population. Of the twenty African countries that have faced food emergencies in recent years, half are either already stressed by water shortage or are projected to fall into the stressed category by 2025 (FAO,2002). There are various degrees of water shortage/scarcity and these could be absolute, life threatening, seasonal, temporary, cyclical, etc.

According to the World Business Council for sustainable Development, water stress applies to situations where there is not enough water for all users, whether agriculture, industrial or domestic. Water stress exists when a region has available renewable water that is less than 1000 cubic meters per capita. When it is less than 2000m3 per capita, water is regarded as a potential constraint for food security (Agbola 2006) and this may lead to water shortage.

Water shortage is a situation of absolute shortfall between available water to meet certain defined minimum requirements. The actual quantity has a spatial variation. Water stress is the symptomatic consequence of scarcity which may manifest itself as increasing conflict between users, over sectoral usage, a decline in service levels, crop failure or food insecurity. Water security is the situation of reliable and secure access to water over time. It does not translate the constraint quantity of supply as much as its predictability which enables measure to be taken in time of scarcity to avoid stress. Water security as highlighted in the ministerial declaration of The Hague (2000) was seen as the key to addressing the emerging global water crisis and improving the role of water management in poverty reduction. Water security is a condition where people have reliable and adequate access to good quality water to meet the full range of their needs and are able to take advantage of the opportunities that water resources present. They are protected from water related hazards and have fair recourse where conflicts over water arise.

From a regional planning perspective, water shortage is often explained in terms of urban morphology. UN Habitat (2003) stressed that water is one of the ecological foot print of a city. Its production, distribution and management often affect and are affected by the settlement forms and structures, which are manifested in the illegality and informality of urban neighborhoods. Urban locations which are densely populated and inaccessible, are definitely without water service networks and are mostly inhabited by the poor. This makes the urban slum dwellers to be mostly affected by water shortage.

The management of water and other natural resources is too often subject to poor governance, which contributes to insufficient and polluted water and threatens the health and livelihood of millions of people. These problems are particularly acute in poorer countries, in which people are mostly dependent on their national resource base (Evans 2006). Water management is highly complex and extremely political. Therefore, balancing competing interests over water allocation and managing water scarcity requires strong institutional approach. The current water resource management structure is centralized and is administered by the state. It is saddled with the responsibility of extracting, treating and distributing to consumers especially in the urban and peri-urban settlements. The state government funds these schemes through budgetary allocations.

3.0 The Contextual Situation in the Niger Delta Region

The study is conducted in the Niger Delta Region (NDR), Nigeria. The region has a landmass of 117, 110km^2 (NDES 2004) forming about 10% of the country's landmass of 923,768km^2. It situates between latitudes 4^0 and 7^0N and longitudes 3^0 and 9^0E within the tropics (Fig.1). NDR consist of the nine oil producing states of Abia, Akwa Ibom, Bayelsa, Cross River, Delta, Edo, Imo, Ondo and Rivers having 185 local government areas. It has a population of 31,224,582 (NPC, 2006) and population densities ranging from 120 to 700 persons per km^2. It is mostly flat, low-lying basis with a dense network of polluted rivers and creeks. The area is a rich and diverse mosaic of varying ecological types-the coastal sandy barrier ridge, the mangrove swamp, the fresh water and the low land rainforest zones. The region has a semi-hot, humid equatorial climate with wide variations from one part of the region to another. It is mostly rural (difficult terrain) with an urbanization index of 6.28%, the least in the country. Table 2 shows population distribution in the region.

Since this region is very wide to cover effectively especially with limited time and resources, the present study covers Akwa Ibom and Cross River states (nos. 2 and 4 in Fig 1).

The region is virtually surrounded by water with the Atlantic Ocean flanking the South, Cameroun River to the east and Benin River to the west. As coastal states, they are characterized by many streams and creeks which are heavily polluted (Ekong, 2005). This scenario has created an illusion of abundance of water for domestic uses and thus eclipsed the reality that adequate fresh water is an increasingly scarce commodity in the region. Investigation has shown that rivers/streams, the major source of domestic water supply in the rural areas are drying up. In the urban areas, potable water scarcity has led to desperate and indiscriminate underground water extraction through borehole drilling. Beside long queues at commercial borehole points and trekking of long distances, water from this boreholes are not safe as most of them are not treated. This, as reported by Bassey (2003), leads to increased wave of waterborne diseases in the region. Consequently, the government of the various states in the region in their effort to rescue the situation has invested heavily on their water corporations since early 1990s.

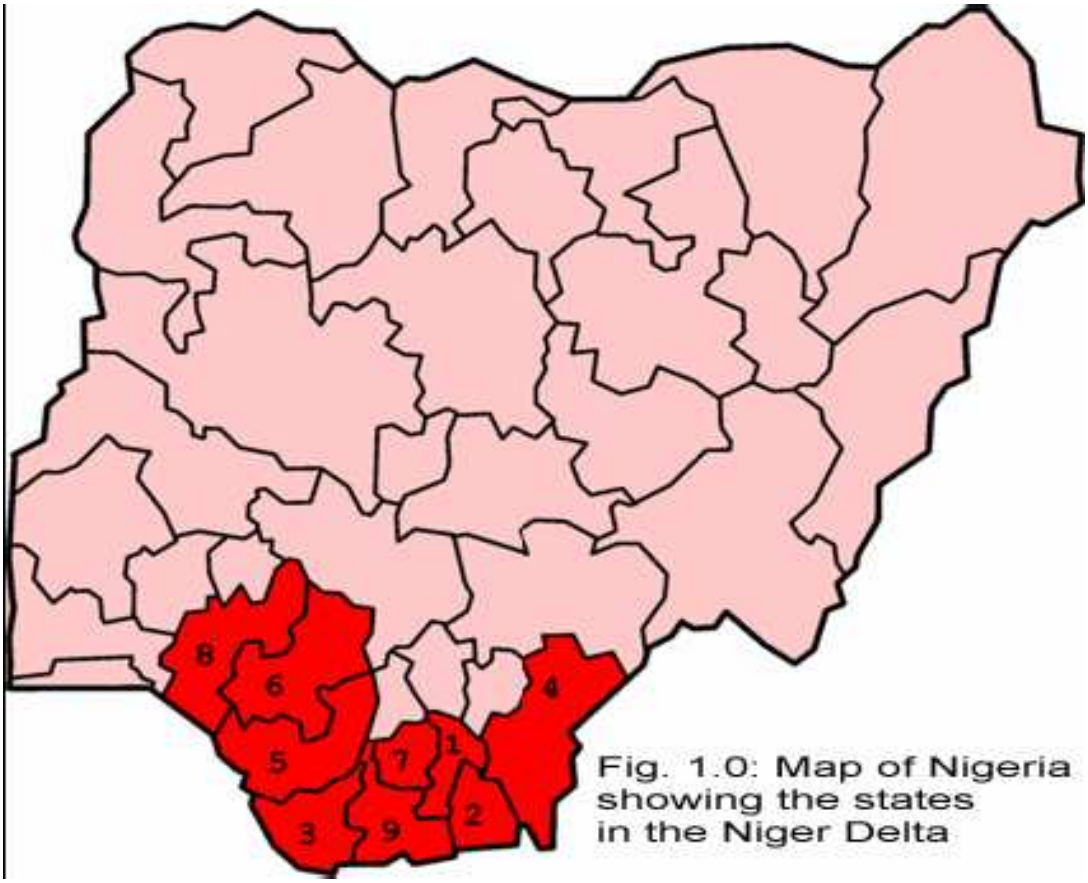

Fig. 1.0: Map of Nigeria showing the states in the Niger Delta

4.0 Research Method

The study employed various methodological approaches. Data on historical and traditional water management strategies were obtained from the national Archives and other water related public agencies. Information on water shortage and other water crisis issues were obtained from literature. For the primary data, a household survey questionnaire was structured to collect information on socio-economic characteristics of the respondents, availability and affordability of the potable water. Using systematic sampling procedure twelve urban centres were sampled. A total of 400 households were selected based on population of the area. To ascertain potability of water, samples from identified sources were

collected for bacteriological and physic-chemical test which were then compared with the water corporations and WHO standards. Table 2 shows the sampling frame.

5.0 Research Result

5.1 Income

There is a wide income disparity in the region. Out of 400 respondents sampled, 28.2% of the households earn less than N5000.00 26.4% earn between N5,000-10,000; 24% earn between N10,000 and N50,000 while just 1.4% earn above N30, 000.00. It could be inferred that 54.6% are low income, 44% medium income with 1.4% as higher income earners. The table also shows that 27.1% of the respondents spending about N10.00 to N20.00 daily, while 37.9% spend above N50.00 daily. If these figures are calculated for a month, it shows that most households spend between N1, 500 and N2, 000 monthly. For a household with income of N10, 000.00, the monthly expenditure on water will be 15% of its income. This is higher than the 3% by the National Water Supply Policy. It should also be noted from the table that households with higher income spend less daily on water. This is because this category of households lives in the government estates where pipe borne water is served at rate of N100.00 per annum (CBN, 2007).

5.2 Sources of Water

From the 400 respondents in the twelve locations, the major source of water for household needs is presented in table 5.
The table shows that water sources within the area range from tap, streams/rivers, water vendors, rain to well/borehole. It shows majority of the people (85.7%) do not have access to good drinking source as only 14.3% get their water from tap which is the only seemingly treated sources. This is consistent with the National Bureau of statistics that water in the majority of the Niger Delta States come from unsafe supply facilities, including streams, rivers, ponds, unprotected wells, boreholes and vendor trucks.

5.3 Qualitative Analysis of Water

Water quality must be considered when evaluating water supply. Adequate provision of water and sanitation depends on some qualitative parameters. They must greatly reduce the risk of infection. For this analysis, Most Probable Number (MPN) was used. Table 6 shows the result of the analysis. The water samples are clear, colourless, odourless and with zero turbidity. The pH scale was used to test for acidity. All stations in Akwa Ibom state have 4. 14 while those in Cross River state have 5.7. These figures indicate that all sources in the region are acidic. However, the Total Suspended Solid (TSS) value is 3.0 and 3.3; this means that there is no suspended solid substance present in the water. Total hardness, calcium hardness and Chlorine contents are within the WHO allowable concentration (WHO 1963). In terms of bacteriological study, the value for total coliform count in all the samples from Cross River show the presence of faucal pathogens. These may have been caused by non conforming land uses and unsanitary conditions in the adjoining properties of the water stations are the likely explanations.

5.4 Water Supply Status in the Region

There is an acute shortfall supply of water to a significant number of people in the region inspite of the general recognition of the importance of water. Table 4 shows water supply

imbalances in the area of study and the challenge of meeting this shortfall which is becoming endemic. For example, even with low coverage, the available quantity of water to household in the region dropped from 119,846 in 2002 to 94,435.8 in 2006 (Table 9)
Daily water consumption per household (Table 8) shows 73.2% of respondents used less than 100 litres of water per day. If this is divided by the National average household size of 5 persons, it shows daily intake of 20 litres per capital in all locations while the remaining 26.8% consumes 40 litres/capita. This is extremely low when compared with the WHO standard of 120 litres per capita per day. This is consistent with the NDES reports in 2004 that more than half of the urban population in the region does not have access to enough potable water.

5.5 Health Outcome

Investments on water supply and evaluation have shown critical improvement on public health. In the region the occurrence of some water borne diseases (Typhoid, dysentery, diarrhea) collected in a time series between 2001 and 2006 (Table 8) shows that such diseases have continued to increase following the inability of the states water corporations to extent their services to cover the entire urban areas. Thus the people drink from unwholesome sources. This can be related to Table 6 which shows qualitative analysis of water.

5.6 Water Governance in the Region

Water governance in the region as in other part of the country is central. There is a common agreement that fully centralized governance systems are mostly inefficient because of high transaction costs, financial constraints and lack of human development. Table 10 shows the government efforts (and resources spent between 2001 and 2007) to make water available and income generated with the region. From the table, government allocations have increased from N2.44million in 2001 to N653 in 2005 when it declines to N24.7million in 2007. Also income accruable from water sales rose from N26.57million – 2001 to N36.00 million in 2007.
On the other hand, the expenditure has been on the increase throughout the period of this study. Apart from 2001, 2006 and 2007 the cooperation operated at deficits, they made a good turnover of more than N400 million yearly. When comparing (Table 8) and that between 2002 and2005 when the corporation in Akwa Ibom state made an excess of N472, 733,000.00 million that they extended their services to only 9,286 consumers with 8960 or 96.5% in the capital cities only. Other years such as 2006 and 2007 experienced deficits.
The key factor in explaining difference in institutional capacity has been the degree of financial autonomy from the state budget. From the analysis, the institutions depend on the states to function and cannot define their own policies and procedures, for example establishing higher pay scales than the regular civil service of N100/m3/month of water. The pressing problems facing the corporations are listed as inadequate funding, poor power supply at pumping stations and distribution of existing pipeline by individual and other contractors.

6.0 Physical Planning Implications and Conclusion

The study shows that most households still depend on unwholesome surface water and/or well/borehole which had led to health problems from water borne diseases. This dilemma is mainly because water has been considered a social good (Agbola, 2003) but not as an economic commodity thus the fully centralization of water governance. Up till now, water supply is still considered the responsibility of the state government and with the expanding urban population, without infrastructure and services expanding proportionally; it is time for government and the public to look inward for solution. One of such will be the recognition of water as an economic good which is central to achieving cost recovery for equitable allocation

and sustainable usage. If water allocations are optimized by benefit and cost recovery, the corporations will break even and will be able to expand their services. The case whereby, for the almost 20 years of their existence, the Water Corporations have not been able to supply water to halve of the urban population should not be overlooked.

The role of the physical planning authority is therefore to provide distribution network plan for all the corporations in line with the urban plan. Physical development planning is under taken to prevent the occurrence lopsided urban development problem. An environmental problem is taken to mean either an inadequate supply of a resource essential to human health and wellbeing or the presence of pathogens/toxic substances and natural/human induced hazards in the environment which can damage human health or physical resources.

The present governance structure should be decentralized and good governance introduced as a vital component of actions to improve environmental sustainability. In that wise, the corporation should be positioned to implement the Integrated Water Resource Management (IWRM) at the local/regional levels if it must achieve the MDGs of Integrated water resource management target of halving by 2015 the proportion of people without sustainable access to safe drinking water and basic sanitation. This will lead to active participation of the citizens and development of other sources of water.

Figures and Tables

Table 1: Status of Water Supply in Nigeria

Settlement	Sector	1996		2004	
		Pop (m)	%	Pop (m)	%
Rural	Water	17	35	22	40
	Sanitation	14.5	30	19	34
Peri-urban	Water	8.1	41	9.3	42
	Sanitation	7.1	30	8.5	38
Urban	Water	15.5	52	18	53
	Sanitation	12	40.5	14.3	91
Total	Water	40	40	49.3	45
	Sanitation	34	34	41.8	38

Source: UNICEF. 2004

Table 2: Projected Population of the Region

States	Land Area	Male	Female	2006	2010	2015	2020
Abia	4,877	1,434,193	1,399,806	2,838,999	2,839,262	2,842,475	2,845,688
Akwa Ibom	6,806	2,044,510	1,875,698	3,920,208	3,920,417	3,925,684	3,928,897
Bayelsa	11,007	902,648	800,710	1,703,358	1,703,621	1,706,834	1,710,047
Cross River	21,930	1,492,465	1,396,501	2,888,966	2,889,229	2,892,442	2,895,655
Delta	17,163	2,074,306	2,024,085	4,098,397	4,098,660	4,101,873	4,105,086
Edo	19,698	1,640,461	1,577,871	3,218,595	3,218,595	3,221,808	3,225,021
Imo	5,165	2,032,286	1,902,613	3,934,899	3,935,162	3,935,162	3,941,588
Ondo	15,086	1,761,263	1,679,761	3,441,024	3,441,287	3,441,287	3,444,500

Rivers	10,378	2,710,665	2,474,735	5,185,400	5,185,663	5,188,876	5,192,089

Source: Projected from NPC 2006 at the average growth rate of 2.83%

Table 3: Sampling Frame

s/n	Locations	2006 population	No. of Households	Sample size
1	Uyo	309,573	61,914	104
2	Abak	139,090	27,818	22
3	Ikot Ekpene	143,077	28,615	23
4	Ikot Abasi	132,023	26,404	14
5	Oron	87,468	17,493	11
6	Eket	172,557	34,511	17
7	Calabar	371,022	74,204	122
8	Yala	210,813	42,162	24
9	Ogoja	171,901	43,380	10
10	Ikom	162,383	32,477	24
11	Obubra	172,111	34,422	15
12	Obudu	160,106	32,021	14
Total		**2,232,123**		**400**

Source: Computed from NPC 2007

Table 4: Relationship between Household Income and Water Expense

	Daily expenses on water (cross tabulation) average daily expenses on water					
Income	₦10	10 – 20	21-30	31-50	50	Total
< 5,000	4 (10.8)	11(28.2)	12(24)	12(25)	40(37.7)	79
5,000-10,000	11(29.7)	10(25.6)	11(22)	12(25)	30(28.3)	74
10,000-15000	10(27.0)	14(36)	8(16)	14(29.2)	22(20.8)	68
15000-30000	10(27.0)	2(5.1)	19(38)	10(20.8)	14(13.2)	75
<30000	2(5.4)	2(5.1)	-	-	-	4
Total	37(13.2)	39(13.9)	50(17.9)		106(37.9)	280

Source: Field survey 2009

Table 5: Major Sources of Water for domestic and commercial uses

Location	**Water Sources**									
	Tap		**Stream/ Rivers**		**Water Vendor**		**Rain**		**Well/borehole**	
	No.	%	No.	%	No.	%	No.	%	No.	%
Abak	6	15	24	31.6	4	7.3	7	33.3	12	13.6
Ikot Ekpene	7	17.5	24	31.6	10	18.2	8	38.1	2	2.3
Ikot Abasi	3	7.5	12	15.8	10	18.2	2	9.5	15	17.1

Uyo	11	27.5	4	5.2	21	38.2	1	4.8	44	50
Oron	2	5	10	13.2	8	14.5	3	14.3	10	11.3
Eket	11	27.5	2	2.6	2	3.6	-	-	5	5.7
Total	40	14.3	76	27.1	55	19.6	21	7.5	88	31.4

Source: Field survey 2009

Table 6: Qualitative Analysis of Water

Parameters mg/litres			
Physical	Akwa Ibom	Cross River	WHO standard
Appearance	Clear	Clear	Clear
Odour	Unobjectable	Unobjectable	Objectable
Colour	5	5	5-50 Units
Turbidity	1.56	1.56	5-25 Units
TSS	3.0	3.3	580 – 1500
PH	4.14	5.7	7.0 -8.5
Chemical			
Alkalinity	6.4	6.4	0.5 – 1.0
T Hardness	7.2	8.6	0 – 120
Calcium ion	-	-	50 -150
Calcium Hardness	70	70	75 – 200
Chloride	0.2	0.5	200 - 600
Bacteriological Total coliforms/ 100ml	0	0	0
E.coli	0	2	

Source: Results conducted January 2009 from AK and C R States

Table 7: Public Water Supply Status

Year	**Daily demand per household (m^3)**	**Daily supply per household (m^3)**	**Population served**	**Deficit (%)**	**Per capita per day (Litres)**
2001	233,794	90,005.5	13,742	220,052.08	109
2002	98,882,928	119,846.07	14,819	974,010.28	134.8
2003	588,340.8	141,531.7	10,488	577,852.8	224.8
2004	3,549,322.8	136,630.29	18,984	706,067.76	120
2005	1,180,458	140,593.03	18,291	1,162,115	128
2006	1,180,537.2	94,435.83	18,422	1,162,115.2	85

Source: AKWC 2008

Table 8: Daily Water Consumption per Household

Household size	**Daily Water Consumption**							
	<5		**5 – 100**		**100 - 150**		**150 - 200**	
	No	**%**	**No**	**%**	**No**	**%**	**No**	**%**
1-2	80	78	40	38.8	6	16.6	-	-
3-5	17	16.6	49	47.6	20	55.5	3	7.7
6-8	5	5	10	9.7	6	16.7	15	38.5
Above 8	-	-	4	3.9	4	11.1	21	53.8
Total	12	36.4	103	36.8	36	12.9	39	13.9

Source: Field survey 2009

Table 9: Cases of Water Borne Diseases (2000–2006)

Diseases	2000	2001	2002	2003	2004	2005	2006
Typhoid	2501	2501	2814	2810	3107	2408	2735
Dysentery	715	334	528	1325	1317	591	631
Cholera	20	18	35	45	53	71	17
Guinea worm	-	-	-	-	-	-	-
Diarrhea	3113	2175	3251	3121	3152	2915	2935
Total	**6349**						**6208**

Source: Public Health Unit of the Ministry of Health in Calabar and Uyo 2008

Table 10: Income and Expenditure (₦B)

ITEM	**2001**	**2002**	**2003**	**2004**	**2005**	**2006**	**2007**
Income (₦) state allocation	2.44	703.80	687	653.0	653.0	19.48	12.7
Water sales	13.57	16.97	6.02	8.88	7.73	18.0	18.0
Total	15.01	720.77	693.02	661.88	660.73	37.48	30.7
Expenditure	168.8	149.6	130.3	155.0	188.8	154.6	390.2
Grand total less expenditure	-153.8	-571.17	+562.72	+506.88	+471.93	-117.12	-359.5

Source: Official Document of the Water Corporations 1999-2007

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