GHANA WATER RESOURCES MANAGEMENT STUDY

INFORMATION BUILDING BLOCK STUDY

RURAL WATER SUPPLY

By

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TABLE OF CONTENTS

1. INTRODUCTION

Ghana has been provided the impetus since the International Drinking Water Supply and Sanitation Decade (1981-1990) to identify and provide solutions to the problems of existing water supply and sanitation systems and also to expand coverage so that more people would enjoy the benefits of good drinking water and adequate sanitation (WRRI, 1992).

As at 1991, the national coverage of potable water supply was 65% comprising urban 93% and rural 50% (WRRI, 1992). The disparity in the percentage of the urban and rural coverage could be partly due to so much initial attention paid to the urban water supply to the neglect of rural areas and partly due to insufficient awareness and knowledge of the role of potable water in health.

The rural water supply, due to the scattered nature of the population which makes supplies by pipe borne systems extremely difficult or impossible, is based mainly on groundwater through drilled boreholes or hand dug wells.

Currently the rural coverage of potable water is estimated at 65%. However with increasing realisation by the Government, district assembles and the communities of the relationship between water and sanitation on one hand and health on the other hand rural water coverage is expected to increase significantly.

The rural water and livestock water supply assessment in this report is based mainly on available data on population in Section A of this report; the available data and information on existing boreholes and the data on livestock in the various regions between 1985 and 1996 provided by the National Livestock Vertinary Services. These regional figures were computed into Basins figures using assumption stated in the text.

2. WATER DEMAND WITHIN THE VOLTA BASIN SYSTEM

2.1Domestic Water Demand

Domestic water demand is the water needed in the homes, families etc (human settlements). It can be broadly categorised as follows:

a) Residential Water Demand

This is the water needed for various activities in the houses and homes such as drinking, cooking, washing and other hygienic purposes. Thus larger settlements with higher and varied hygienic amenities have higher residential water demand.

b) Institutional Water Demand

This covers the water need of schools, hospitals, offices, parks, churches, banks etc. This aspect of water demand is dependent on the availability of these structures in the human settlement. Thus the larger communities which have varieties of these structures also have higher institutional water demand than the smaller communities. Institutional water demand thus predominates in towns.

c) Commercial Water Demand

This covers the water needs of commercial activities located within the human settlements eg. canteens, shops restaurants and laundries. These small scale commercial activities are more common in the larger communities within the smaller communities than in the smaller communities, thus the commercial water demand is also dependent on the size of the community. Commercial water demand therefore predominates in commercial centres.

d) Small-Scale Industrial Water Demand

This type of water demand covers industries which are organised more or less along traditional lines mostly at homes. The industries include both dry (wood,
leather and metal works) and wet (soap making, clay work and food processing)
industries.

2.2Human Settlements

Human settlements within the White Volta Basin System are categorised broadly into Urban and Rural communities depending on the population size. Urban community is a settlement with population size equal to or greater than 5,000 while rural community has population size less than 5,000.

2..2.1Population Projection

The estimation of domestic water demand requires the knowledge of the population to be served as well as the mix and extent of uses other than household (UNO, 1976).

Furthermore the knowledge of the distribution of the Urban and Rural population within the boundaries of the Basin is also important since one person served by a municipal system may use from five to ten times as much water for domestic purposes as a rural person (UNO, 1976).

The merger and re-alignment of some former local council areas to form new districts in the wake of the District Assembly as well as inadequate delineation of district boundaries have made it very difficult if not impossible to have good estimates of the population in district bases based on the 1970 an 1984 census results. Consequently the population projection is carried out for the Basin as a whole and not on district basis.

The current and projected population figures for the Volta Basin System can be found in the A series of this volume under population by Prof. J.S. Nabila.

2.3Current and Projected Domestic Water Demand

The domestic water demand is estimated using Tahal Consultancy Engineers' 1981 water consumption design criteria for various community sizes adopted by the Ghana Water and Sewerage Corporation. The Tahal (1981) water consumption design take into consideration residential, commercial and Institutional as well as small scale cottage industrial water demands. The per capita water consumption levels are presented in table 6.

TABLE 6WATER CONSUMPTION DESIGN CRITERIA FOR VARIOUS POPULATION SIZES IN LITRES PER CAPITA PER DAY

		PER CAPITA WATER CONSUMPTION (litres day^{-1})				
	YEAR	**1980**	**1990**	**2000**	**2010**	**2020**
POPULATION SIZE	<2000	22.5	22.5	30.0	30.0	30.0
	2000-5000	50.0	55.0	60.0	65.0	65.0
	5001-10000	60.0	65.0	70.0	70.0	70.0
	>10000	70.0	80.0	85.0	90.0	90.0

The per capita water consumption figures are assumed to represent a peak day demand. Annual demand is taken as 300 days of peak demand, thus allowing for a seasonal variation factor (peak/average) of 1.2 (Nathan Consortium, 1970). The per capita water consumption figures for 2020 have been computed on the assumption that the trend in 2010 will be the same in 2020.

Since the settlements are not differentiated, the mean per capita for population less than 2000 and 2000 - 5000 has been assumed for all the rural settlements. Thus using this mean, the peak demand and the population figure, the current (1995) and projected (2000-2020) domestic rural water demand for the various basins within the Volta Basin System are presented in Tables 7-11.

TABLE 7 CURRENT AND PROJECTED RURAL DOMESTIC WATER DEMAND FOR THE WHITE VOLTA BASIN

YEAR	TOTAL POPULATION	URBAN POPULATION	RURAL POPULATION	ANNUAL Rural Water Demand m^3	
1984	1,296,468	149,987	1,146,481	12,467,980	12.5×10^6
1990	1,460,634	194,658	1,265,976	14,716,971	14.7×10^6
1995	1,768,669	243,447	1,525,222	19,172,041	19.2×10^6
2000	2,041,690	306,467	1,735,223	23,425,511	23.4×10^6
2005	2,360,310	388,445	1,971,865	27,359,627	27.4×10^6
2010	2,732,615	496,685	2,235,930	31,862,003	31.9×10^6
2015	3,168,179	640,640	2,527,539	36,965,258	37.0×10^6
2020	3,678,365	833,998	2,844,367	42,665,505	42.7×10^6

TABLE 8 CURRENT AND PROJECTED RURAL DOMESTIC WATER DEMAND FOR THE BLACK VOLTA BASIN

YEAR	TOTAL POPULATION	URBAN POPULATION	RURAL POPULATION	ANNUAL Rural Water Demand m^3	
1984	607,372	160,467	446,905	4,866,795.45	4.9×10^6
1990	738,449	129,054	609,395	7,087,263.85	7.1×10^6
1995	872,332	153,181	719,151	9,039,728.07	9.0×10^6
2000	1,034,067	182,305	851,762	11,498,787.00	11.5×10^6
2005	1,230,088	217,523	1,012,565	14,064,527.85	14.1×10^6
2010	1,468,405	260,163	1,208,242	17,217,448.05	17.2×10^6
2015	1,759,241	311,905	1,447,336	21,174,525.68	21.2×10^6
2020	2,115,192	374,655	1,740,537	26,108,055.00	26.1×10^6

TABLE 9 CURRENT AND PROJECTED RURAL DOMESTIC WATER DEMAND FOR THE MAIN VOLTA BASIN

YEAR	TOTAL POPULATION	URBAN POPULATION	RURAL POPULATION	ANNUAL Rural Water Demand m^3	
1984	1,994,022	114,344	1,879,678	20,469,693.42	20.5×10^6
1990	2,358,764	562,832	1,794,932	20,875,059.16	20.9×10^6
1995	2,598,712	658,067	1,940,645	24,393,907.67	24.4×10^6
2000	3,002,972	770,868	2,232,104	30,133,404.00	30.1×10^6
2005	3,485,521	906,296	2,579,225	35,825,435.25	35.8×10^6
2010	4,063,649	1,069,387	2,994,262	42,668,233.05	42.7×10^6
2015	4,758,836	1,266,384	3,492,452	51,094,572.76	51.1×10^6
2020	5,597,790	1,505,090	4,092,700	61,390,500.00	61.4×10^6

TABLE 10 CURRENT AND PROJECTED RURAL DOMESTIC WATER DEMAND FOR THE DAKA BASIN

YEAR	TOTAL POPULATION	URBAN POPULATION	RURAL POPULATION	ANNUAL Rural Water Demand m^3	
1984	144,910	36,920	107,990	1,176,011.01	1.2×10^6
1990	171,842	42,683	129,159	1,502,119.17	1.5×10^6
1995	198,702	48,199	150,503	1,891,822.71	1.9×10^6
2000	230,416	54,454	175,962	2,375,487.00	2.4×10^6
2005	267,942	61,548	206,394	2,866,812.66	2.9×10^6
2010	312,438	69,595	242,843	3,460,512.75	3.5×10^6
2015	365,305	79,257	286,048	4,184,882.24	4.2×10^6
2020	428,240	95,500	332,740	4,991,100.00	5.0×10^6

TABLE 11 CURRENT AND PROJECTED RURAL DOMESTIC WATER DEMAND FOR THE OTI BASIN

YEAR	**TOTAL POPULATION**	**URBAN POPULATION**	RURAL POPULATION	ANNUAL Rural Water Demand m^3	
1984	350,480	37,995	312,485	3,402,961.65	3.4×10^6
1990	425,515	46,693	378,822	4,405,699.86	4.4×10^6
1995	501,149	55,934	445,215	5,597,352.55	5.6×10^6
2000	591,223	67,926	523,297	7,064,509.05	7.1×10^6
2005	698,615	83,544	615,071	8,543,336.19	8.5×10^6
2010	826,793	103,952	722,841	10,300,484.25	10.3×10^6
2015	979,942	130,689	849,253	12,424,571.39	12.4×10^6
2020	1,163,109	165,803	997,306	14,959,590.00	15.0×10^6

2.4Livestock Water Demand

The information on livestock water demand in the Volta Basin System is diffused owing to the lack of general knowledge on the concentration and organised development of livestock within the Basin. However the approach adopted for the estimation of livestock water demand is based on the use of the livestock population figures and the estimated unit water requirement for the different types of livestock (WRRI/FAO, 1989).

The current (1995) livestock population figures were computed from the National Livestock Census figures for 1994 (Verterinary Service, 1994).

Owing to the nomadic nature of livestock particularly cattle within the Basin an even distribution was assumed. The average growth rate of the different livestock species are as follows: Cattle 1.6%, Sheep 2.4%, Goat 3.3%, Pig 2.6%, Poultry 6.3% (Verterinary Services, 1994).

2.4.1Livestock Population Projection

The population of the livestock is projected on the assumption that:

1.The livestock species which dominate the Basin would not change between now and 2020

2.The growth rate would not change significantly between now and 2020

The population projection formula used is given by $P = Poe^{rt}$

Where P_o is the population which is known

P is the population to be estimated

r is the rate of growth

t is the time internal.

The above formula seem to fit the livestock population data more closely than all the other formulae tried, consequently this formula was used in computing the projected livestock population for 1995, 2000, 2005, 2010,, 2015 and 2020. These are presented in table 12-16.

TABLE 12 CURRENT AND PROJECTED LIVESTOCK POPULATION FOR THE WHITE VOLTA BASIN

YEAR	CATTLE	SHEEP	GOAT	PIG	POULTRY	TOTAL
1995	631708	658685	665928	170126	2170405	2126447
2000	865604	902569	912494	233117	2974018	5887802
2005	1186102	1236754	1250353	319430	4075175	8067814
2010	1625267	1694674	1713308	437702	5584047	11054990
2015	2227037	2322142	2347677	599766	7651592	15148214
2020	3051618	3181937	3216926	821835	10494666	20756982

TABLE 13 CURRENT AND PROJECTED LIVESTOCK POPULATION FOR THE BLACK VOLTA BASIN

YEAR	CATTLE	SHEEP	GOAT	PIG	POULTRY
1995	216611	253405	259144	44570	893888
2000	234652	285714	305632	50758	1224859
2005	254195	322141	360461	57805	1678374
2010	275367	363213	425125	65830	2299808
2015	298301	409522	501390	74969	3151334
2020	323146	461735	591336	85376	4318144

TABLE 14 CURRENT AND PROJECTED LIVESTOCK POPULATION FOR THE MAIN VOLTA BASIN

YEAR	CATTLE	SHEEP	GOATS	PIGS	POULTRY
1994	198754	459502	449345	69574	2256225
1995	201960	470663	464421	71407	2402940
2000	218780	530672	547735	81320	3292651
2005	237002	598331	645994	92609	4511786
2010	256741	674616	761881	105466	6182317
2015	278124	760627	898558	120108	8471377
2020	301288	857605	1059753	136782	11607983

TABLE 15 CURRENT AND PROJECTED POPULATION OF LIVESTOCK SPECIES IN THE DAKA BASIN

YEAR	CATTLE	SHEEP	GOAT	PIG	POULTRY
1995	72986	60686	74091	13486	269086
2000	79065	68424	87382	15358	346205
2005	85650	77147	103058	17490	474390
2010	92783	86983	121546	19918	650038
2015	100511	98074	143350	22684	890720
2020	108882	110578	169067	25833	1220518

TABLE 16 CURRENT AND PROJECTED LIVESTOCK POPULATION FOR THE OTI BASIN

YEAR	CATTLE	SHEEP	GOATS	PIG	POULTRY
1995	163791	137283	169121	30568	594281
2000	174616	151115	192985	33919	764599
2005	189159	170382	227606	38627	1047700
2010	204914	192105	268436	43990	1435620
2015	221981	216597	316592	50897	1967172
2020	240469	244213	373386	57052	2695535

2.4.2 Livestock Water Requirement

The livestock water requirement particularly the voluntary water intake mainly depend on the quality of food and air temperature. In the dry season forage contains less water consequently the voluntary water intake of livestock is about 50% more than during the wet season (Serres, 1980). The total water requirement including the voluntary water intake for the various livestock within the Volta Basin System is presented Table 17.

TABLE 17 LIVESTOCK WATER REQUIREMENT INCLUDING VOLUNTARY WATER INTAKE

	CATTLE	SHEEP	GOAT	PIG	POULTRY
Tropical Livestock Unit (T L U)	0.7	0.1	0.1	0.4	0.006
Total Water Requirement (TWR) Litre/day/head	27.0	5.0	5.0	15.0	0.25
Wet SeasonVoluntary Water Rquirement (WSVWR) Litre/day/head	10.0	2.0	2.0	6.0	0.10
Dry SeasonVoluntary Water Rquirement (DSVWR) Litre/day/head	27.0	5.0	5.0	15.0	0.25

Source WRRI/FAO (1989)

In estimating the current and the projected water demand, the total Water Requirement Unit was used. Thus the formula for estimating the water demand is given

Livestock Water Demand = Population x TWR x 365 (no of days in the year).

Using the formula, the current (1995) and the projected (2000-2020) water demand for Livestock in the Volta Basin System are presented in Tables 18-22.

TABLE 18 THE CURRENT AND PROJECTED LIVESTOCK WATER DEMAND FOR THE WHITE VOLTA BASIN.

YEAR	CATTLE (m^3)	SHEEP (m^3)	GOAT (m^3)	PIG (m^3)	POULTRY (m^3)	TOTAL (m^3)	
1995	6225482	1202100	1215319	931440	198049	9772390	9.8×10^6
2000	8530527	1647188	1665302	1276316	271379	13390712	13.4×10^6
2005	11689035	2257076	2281894	1748879	371860	18348744	18.3×10^6
2010	16017006	3092780	3126787	2396418	509544	25142535	25.1×10^6
2015	21947450	4237909	4284511	3283719	698208	34451797	34.5×10^6
2020	30073696	5807035	5870890	449957	956726	43158304	43.2×10^6

TABLE 19 CURRENT AND PROJECTED LIFE STOCK WATER DEMAND FOR BLACK VOLTA

YEAR	CATTLE (m^3)	SHEEP ($m^{3)}$	GOAT (m^3)	PIG ($m^{3)}$	POULTRY ($m^{3)}$	TOTAL Water Demand
1995	2134701	462464	472938	244021	81567	$3.4x10^6$
2000	2312495	521428	557778	277901	111768	$3.8x10^6$
2005	2505092	587858	657841	316482	153152	$4.2x10^6$
2010	2713742	662864	775853	3604193	209857	$4.7x10^6$
2015	2939756	747378	915037	410455	287559	$5.3x10^6$
2020	3184604	842666	1079188	467434	394031	$6.0x10^6$

TABLE 20 CURRENT AND PROJECTED LIVESTOCK WATER DEMAND FOR THE MAIN VOLTA BASIN

YEAR	CATTLE WATER DEMAND (m^3)	SHEEP WATER DEMAND (m^3)	GOATS WATER DEMAND (m^3	PIGS WATER DEMAND (m^3)	POULTRY WATER DEMAND (m^3)	TOTAL WATER DEMAND (m^3)	
1995	1990316	858960	847568	390953	219268	4307065	4.3×10^6
2000	2156077	968476	999616	445227	300454	4869850	4.9×10^6
2005	2335655	1091954	1178939	507034	411700	5525282	5.5×10^6
2010	2530183	1231174	1390433	577426	564136	6293352	6.3×10^6
2015	2740912	1388144	1639868	657591	773013	7199528	7.2×10^6
2020	2969193	1565129	1934049	748881	1059228	8276480	8.3×10^6

TABLE 21 CURRENT AND PROJECTED LIVESTOCK WATER DEMAND FOR THE DAKA BASIN

YEARS	CATTLE m^3	SHEEP m^3	GOAT m^3	PIG m^3	POULTRY m^3	TOTAL m^3	m^3
1995	719277	110752	135216	73836	24554	1063635	1.1x10
2000	779186	124874	159472	84085	31591	1179208	1.2x10
2005	844081	140793	188081	95758	43288	1312001	1.3x10
2010	914376	158744	221821	109051	59315	1463307	1.5x10
2015	990536	178985	261614	124195	81278	1636608	1.6x10
2020	1073032	201805	308547	141436	111373	1836192	1.8x10

TABLE 22 CURRENT AND PROJECTED LIVESTOCK WATER DEMAND FOR THE OTI BASIN

YEAR	CATTLE (m^3)	SHEEP (m^3)	GOAT (m^3)	PIG (m^3)	POULTRY (m^3)	TOTAL (m^3)
1995	1614160	250541	308646	167360	54228	2.4×10^6
2000	1720841	275785	352198	185707	69770	2.6×10^6
2005	1864162	310947	415382	211483	95600	2.9×10^6
2010	2019427	350592	489896	240845	131000	3.2×10^6
2015	2187623	395291	577780	278661	179504	3.6×10^6
2020	2369822	445689	681429	312360	245969	4.1×10^6

The total rural water demand (domestic and livestock) for the individual basins within the the Volta Basin System are presented in Tables 23-27.

TABLE 23 AND PROJECTED RURAL WATER DEMAND FOR THE WHITE VOLTA BASIN

YEAR	RURAL DOMESTIC WATER DEMAND (10^6 m^3)	LIVESTOCK WATER DEMAND (10^6 m^3)	TOTAL RURAL WATER DEMAND (10^6 m^3)
1995	19.2	9.8	29.0
2000	23.4	13.4	36.8
2005	27.4	18.3	45.7
2010	31.9	25.1	57.0
2015	37.0	34.5	71.5
2020	42.7	43.2	85.9

TABLE 24 CURRENT AND PROJECTED RURAL WATER DEMAND FOR THE BLACK VOLTA BASIN

YEAR	DOMESTIC RURAL WATER DEMAND ($106m^3$)	LIVESTOCK WATER DEMAND (10^6m^3)	TOTAL RURAL WATER DEMAND (10^6 m^3)
1995	9.0	3.4	12.4
2000	11.5	3.8	15.3
2005	14.1	4.2	18.3
2010	17.2	4.7	21.9
2015	21.2	5.3	26.5
2020	26.1	6.0	32.1

TABLE 25 CURRENT AND PROJECTED RURAL WATER DEMAND FOR THE MAIN VOLTA BASIN

YEAR	RURAL DOMESTIC WATER DEMAND (10^6 m^3)	LIVESTOCK WATER DEMAND (10^6 m^3)	TOTAL RURAL WATER DEMAND (10^6 m^3)
1995	24.4	4.3	28.7
2000	30.1	4.9	35.0
2005	35.8	5.5	41.3
2010	42.7	6.3	49.0
2015	51.1	7.2	58.3
2020	61.4	8.3	69.7

TABLE 26 CURRENT AND PROJECTED RURAL WATER DEMAND FOR THE DAKA BASIN

YEAR	DOMESTIC RURAL WATER DEMAND ($106m^3$)	LIVESTOCK WATER DEMAND ($106m^3$)	TOTAL RURAL WATER DEMAND (10^6 m^3)
1995	1.9	1.1	3.0
2000	2.4	1.26	3.6
2005	2.9	1.39	4.2
2010	3.5	1.5	5.0
2015	4.2	1.6	5.8
2020	5.0	1.8	6.8

TABLE 27 CURRENT AND PROJECTED RURAL WATER DEMAND FOR THE OTI BASIN

YEAR	DOMESTIC RURAL WATER DEMAND ($106m^3$)	LIVESTOCK WATER DEMAND ($106m^3$)	TOTAL RURAL WATER DEMAND (10^6 m^3)
1995	5.6	2.4	8.0
2000	7.1	2.6	9.7
2005	8.5	2.9	11.4
2010	10.3	3.2	13.5
2015	12.4	3.6	16.0
2020	15.0	4.1	19.1

VOLTA BASIN SYSTEM

Current Water Supply Situation

The regional distribution of boreholes as at 1994 is presented in table 28.

Table 28 Regional Distribution of Boreholes - 1994

Region	No. of Boreholes
Upper East	1680
Upper West	1350
Northern	1340
Brong Ahafo	855
Ashanti	1310
Western	700
Eastern	950
Central	925
Volta	1140
Greater Accra	210
TOTAL	10,460

Source: Kortatsi, 1994.

Assuming uniform distribution of borehole in each region (this may not be true in some cases since the population density varies from place to place and some places are supplied by pipe borne water and springs), then the approximate number of boreholes in the Volta Basin system is 6800. The breakdown is as follows: White Volta Basin 3007; Black Volta Basin 895, Main Volta Basin 2163, Daka Basin 204 and the Oti Basin 531.

The average yield of boreholes in the various basins are as follows: White Volta Basin 2.1 $m^3 h^{-1,}$ Black Volta Basin 2.2$m^3 h^{-1}$; Main Volta Basin 5.1 $m^3 h^{-1}$, Daka 4.6 $m^3 h^{-1}$ and the Oti Basin 4.4 $m^3 h^{-1}$

Although the pumping test performed on most of these wells lasted for only 6 hours and sometimes 3 hours except in the case of a few mechanised wells that pumping lasted for 24 hours, for these computation of the annual abstractions a 12 hour a day pumping period has been used. This is to cater for abstraction by hand dug wells believed to be of the same magnitude as abstraction by boreholes.

For most of the Basins within the Volta Basin System, water abstraction from boreholes is intensive during the dry season but reduces drastically during the raining season. Using expert's judgement, a peak period abstraction of 300 days per year seems reasonable.

On the above assertion, the annual groundwater abstraction is computed using the formula:

$Q = 3600\ Na$

where Q -is groundwater abstraction

N -Number of boreholes

a -the mean yield

The proportionality constant is the number of effective pumping hours in the year.

Using the above formula, the groundwater abstractions for the Volta Basin are computed and presented in table 30.

Table 30: Estimated Annual Abstraction

Basin	No. of Boreholes	Yield ($m^3 h^{-1}$)		Current Annual Abstraction $x10^6 m^3$
		Range	Mean	
White Volta Basin	3007	0.3-24.0	2.1	18.2
Black Volta Basin	895	0.1-36.0	2.2	5.7
Main Volta	2163	0.02-36.0	5.1	26.5
Daka	204	0.5-18.0	4.6	2.3
Oti	531	0.6-36.0	4.4	5.6

Comparison between current annual abstraction and current rural water demand.

The comparison between the current water demand and annual abstraction is presented in Table 31.

Table 31: Current Annual Abstraction and Water Demand

Basin	Current Water Demand $x10^6$ m^3	Annual Abstraction $x10^6$ m^3	Excess demand over abstractionx 10^6 m^3	% Excess demand over abstraction
White Volta	29.0	22.7	6.3	27.8
Black Volta	12.4	7.1	5.3	74.6
Main Volta	28.7	39.7	-11	-27.7
Daka	3.0	2.6	0.4	15.4
Oti	8.0	7.3	0.7	9.6

From Table 31 it is quite apparent that current rural water demand in the Volta Basin system outstrips the water supply (annual abstractions) from groundwater sources

In the White Volta Basin the Current rural water demand outstrips the annual supply by 27.8% while in the Black Volta Basin the current rural water demand is in excess of the groundwater abstraction by boreholes as much as 74.6%. In the Daka and the Oti Basins, the Water demand outstrips the water supply by 15.4%, and 9.6%

respectively. However in the Main Volta Basin the supply apparently outstrips the demand by 27.7%.

The conclusions one draws from this is that there is the need for further groundwater development for supply to match up with the demand in all the Basins which form the Volta Basin System except the Main Volta .

In the Main Volta Basin, the Boreholes are on average high yielding. Since the wells are mostly not mechanised, most of the water which should have gone into supply are under utilised. Thus although supply seems to have outstrip demand, there is still the need for better coverage.

FINDINGS

(1)The current rural water demand for each of the Basins within the Volta system are as follows;

(a) White Volta Basin 29.0 million cubic metres

(b)Black Volta Basin 12.4 " " "

(c)Main Volta Basin 28.7 " " "

(d)Daka Basin 3.0 " " "

(e)Oti Basin 8.0 " " "

(2)The projected rural water demand for the White Volta Basin as for the year 2000, 2005, 2010, 2025, 2020 are as follows; 36.8, 45.7,57.0,71.5 and 85.9 million cubic metres.

For the Black Volta Basin the projected rural water demand for the year 2000, 2005, 2010, 2015 and 2020 are 15.3, 18.3, 21.9, 26.5, 32.1 million cubic metres.

In the main Volta Basin the projected rural water demands are 35.0, 41.3, 49.0, 58.3 and 69.7 million cubic metres for the years 2000, 2005, 2010, 2020 respectively.

The projected rural water demand in the years 2000, 2005, 2010, 2015, 2020 for the Daka Basin are 3.6, 4.2, 5.0, 5.8 and 6.89 million cubic metres respectively.

In the Oti Basin the projected rural water demand for the years 2000, 2005, 2010, 2015, and 2020 are 9.7, 11.4, 13.5, 16.0 and 19.1 million cubic metres respectively.

(3)Comparing the replenishable groundwater and the rural water demand in the various basins within the Volta Basin System has clearly indicated that the rural water demand to 2020 can be conveniently met from the replenishable groundwater.

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