

Appendix D. Data: Case Accra

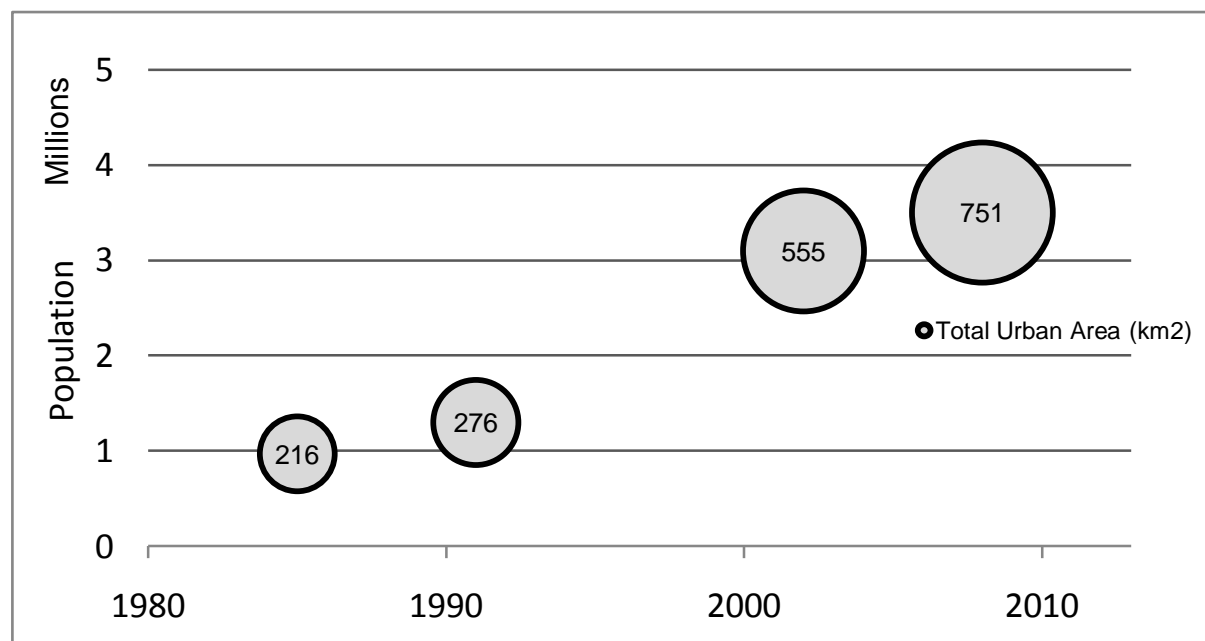
Accra population

Year	population	Source	annual growth rate	year	population	Source	annual growth rate
1891	19,999	census, Patterson 1979		1970	636,667	636,667	0.030471
1901	17,892	census, Patterson 1979		1971	656,067	<i>interpolated</i>	
1910	18,506	<i>interpolated</i>		1972	676,057	<i>interpolated</i>	
1911	18,574	census, Patterson 1979		1973	696,657	<i>interpolated</i>	
1912	20,573	<i>interpolated</i>		1974	717,885	<i>interpolated</i>	
1913	22,572	<i>interpolated</i>		1975	739,759	<i>interpolated</i>	
1914	24,571	<i>interpolated</i>		1976	762,300	<i>interpolated</i>	
1915	26,570	<i>interpolated</i>		1977	785,528	<i>interpolated</i>	
1916	28,569	<i>interpolated</i>		1978	809,464	<i>interpolated</i>	
1917	30,568	<i>interpolated</i>		1979	834,129	<i>interpolated</i>	
1918	32,567	<i>interpolated</i>		1980	859,545	<i>interpolated</i>	
1919	34,566	<i>interpolated</i>		1981	885,736	<i>interpolated</i>	
1920	36,565	<i>interpolated</i>		1982	912,725	<i>interpolated</i>	
1921	38,573	census, Patterson 1979		1983	940,536	<i>interpolated</i>	
1922	40,872	<i>interpolated</i>		1984	969,195	969,195	0.038
1923	43,171	<i>interpolated</i>		1985	1,006,024		
1924	45,470	<i>interpolated</i>		1986	1,044,253		
1925	47,769	<i>interpolated</i>		1987	1,083,935		
1926	50,068	<i>interpolated</i>		1988	1,125,124		
1927	52,367	<i>interpolated</i>		1989	1,167,879		
1928	54,666	<i>interpolated</i>		1990	1,212,258		
1929	56,965	<i>interpolated</i>		1991	1,258,324		
1930	59,264	<i>interpolated</i>		1992	1,306,141		
1931	61,558	census, Patterson 1979		1993	1,355,774		
1932	64,875	1979		1994	1,407,293		
1933	68,192	<i>interpolated</i>		1995	1,460,771		
1934	71,509	<i>interpolated</i>		1996	1,516,280		
1935	74,826	<i>interpolated</i>		1997	1,573,898		
1936	78,143	<i>interpolated</i>		1998	1,633,707		
1937	81,460	<i>interpolated</i>		1999		Greater Accra Region	3.4% growth extrapolated
1938	84,777	<i>interpolated</i>		2000	1,658,937	2,905,726	
1939	88,094	<i>interpolated</i>		2001	1,715,341	3,004,521	
1940	91,411	<i>interpolated</i>		2002	1,773,662	3,106,674	
1941	94,728	<i>interpolated</i>		2003	1,833,967	3,212,301	
1942	98,045	<i>interpolated</i>		2004	1,896,322	3,321,520	
1943	101,360	census, Patterson 1979		2005	1,960,797	3,434,451	
1944	108,273	<i>interpolated</i>		2006	2,027,464	3,551,223	
1945	115,186	<i>interpolated</i>		2007	2,096,398	3,671,964	
1946	122,099	<i>interpolated</i>		2008	2,167,675	3,796,811	
1947	129,012	<i>interpolated</i>		2009	2,241,376	3,925,902	
1948	135,926	census, Patterson 1979		2010	2,317,583	4,059,383	

1949	142,994	<i>interpolated</i>	1.052	2011	2,396,381	4,197,402
1950	150,430	<i>interpolated</i>		2012	2,477,858	4,340,114
1951	158,252	<i>interpolated</i>		2013	2,562,105	4,487,678
1952	166,481	<i>interpolated</i>		2014	2,649,216	4,640,259
1953	175,138	<i>interpolated</i>		2015	2,739,290	4,798,028
1954	184,246	<i>interpolated</i>		2016	2,832,426	4,961,161
1955	193,826	<i>interpolated</i>		2017	2,928,728	5,129,840
1956	203,905	<i>interpolated</i>		2018	3,028,305	5,304,255
1957	214,508	<i>interpolated</i>		2019	3,131,267	5,484,599
1958	225,663	<i>interpolated</i>		2020	3,237,730	5,671,076
1959	237,397	<i>interpolated</i>		2021	3,347,813	5,863,892
1960	338,396	census, Patterson 1979		2022	3,461,639	6,063,264
1961	362,761	<i>interpolated</i>	1.072	2023	3,579,334	6,269,415
1962	388,879	<i>interpolated</i>		2024	3,701,032	6,482,576
1963	416,879	<i>interpolated</i>		2025	3,826,867	6,702,983
1964	446,894	<i>interpolated</i>		2026	3,956,980	6,930,885
1965	479,070	<i>interpolated</i>		2027	4,091,518	7,166,535
1966	513,563	<i>interpolated</i>		2028	4,230,629	7,410,197
1967	550,540	<i>interpolated</i>		2029	4,374,471	7,662,144
1968	590,179	<i>interpolated</i>		2030	4,523,203	7,922,656
1969	632,672	<i>interpolated</i>				

Accra built-up area Source: Yankson et al 2004

Label	Year	Total Urban Area (km ²)	Growth in period (km ²)	Yearly growth in period (km ²)	population
Urban	1985	216	-	-	969,195
Urban	1991	276	60	10	1,300,000
Urban	2002	555	279	25	3,100,000
Transition + Urban	2008	751	196	-	3,500,000



Accra Water Supply Source: AVRL unpublished data

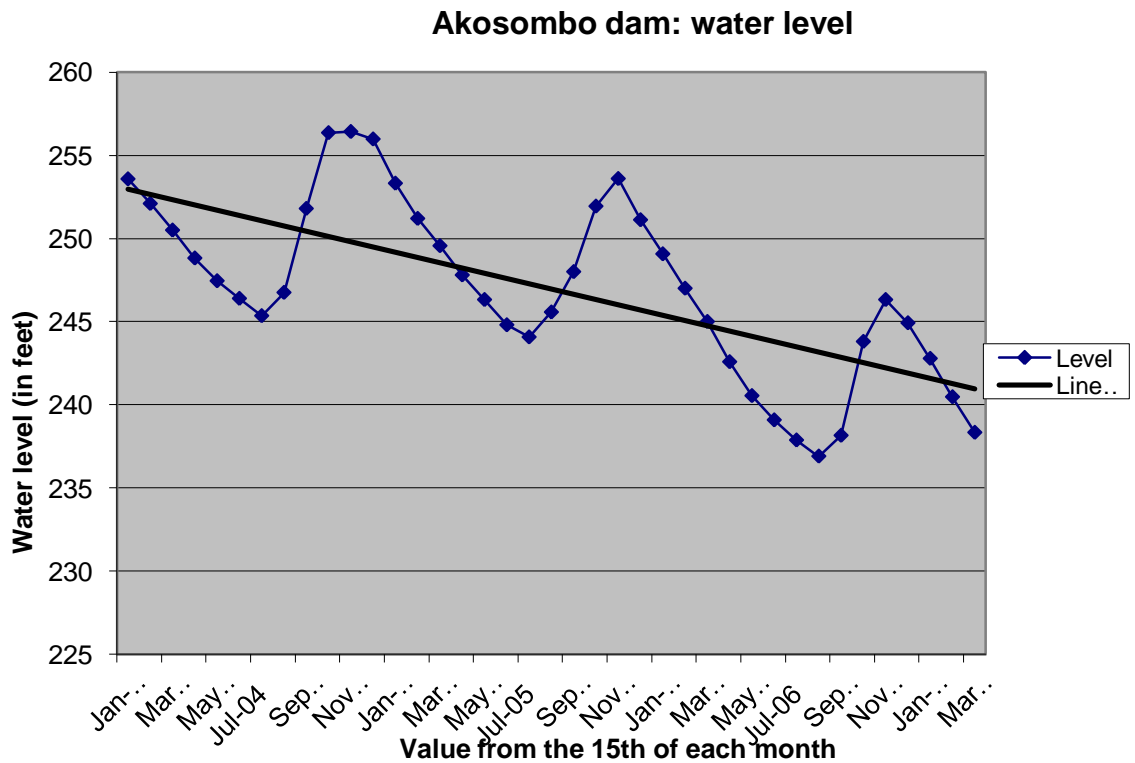
Water treated for ATMA 1996-2006

year	Weija		Kpong		Groundwater		TOTAL
	gallons	cubic metre	gallons	cubic metre	cubic metre	gallons	cubic metre
1996	7,505,920,000	34,122,590	15,060,655,000	68,467,097		22,566,575,000	102,589,687
1997	7,445,316,765	33,847,082	16,070,446,500	73,057,701		23,515,763,265	106,904,783
1998	8,826,547,533	40,126,282	16,520,535,321	75,103,845		25,347,082,854	115,230,127
1999	7,470,206,284	33,960,232	13,758,519,595	62,547,472		21,228,725,879	96,507,704
2000		38,096,000		72,095,784	178,682	24,278,106,978	110,370,466
2001		40,228,000		72,637,518	314,952	24,896,221,364	113,180,470
2002		55,187,000		72,179,918	302,880	28,083,427,534	127,669,797
2003		55,324,000		70,449,877	439,037	27,748,273,830	126,146,158
2004		60,988,000		71,642,081	501,882	29,159,973,027	132,563,870
2005		62,383,000		70,799,554	517,731	29,377,435,272	133,552,473
2006		62,960,000		65,232,883	377,032	27,194,653,023	123,629,348

SYS_NAME	SYS_LOC	SYST_TYPE	Serv_Area	Production of raw water (m3/year)	Production of treated water (m3/year)	Plant capacity, design (m3/day)	Average plant capacity, actual (m3/day)	Syst_type
Kpong New	KPONG	surface water	ATMA	61,369,489	58,136,665	181,818	159,280	Surface water
Kpong Old	KPONG	surface water	ATMA	13,131,091	12,464,845	38,636	34,150	Surface water
Total Kpong				74,500,580	70,601,510	220,454	193,430	
Weija -Adam Clark	WEIJA	surface water	ATMA	48,117,071	44,746,911	134,000	122,580	Surface water
Weija Candy	WEIJA	surface water	ATMA	6,926,738	8,598,451	39,440	23,555	Surface water
Weija -Bamag	WEIJA	surface water	ATMA	12,330,064	8,650,654	30,240	23,852	Surface water
total Weija				67,373,873	61,996,016	203,680	169,987	
Anum Boso	ANUM	surface water	ATMA	139,478	92,055	100	252	Surface water
Total ATMA				142,013,931	132,689,581	424,234	363,669	
Continued:								

Akosombo Lake Level

	lake Level	12 months average
Jan-04	253.58	
Feb-04	252.1	
Mar-04	250.5	
Apr-04	248.82	
May-04	247.45	
Jun-04	246.39	
Jul-04	245.35	
Aug-04	246.75	
Sep-04	251.8	
Oct-04	256.36	
Nov-04	256.43	
Dec-04	255.98	250.9591667
Jan-05	253.32	250.9375
Feb-05	251.2	250.8625
Mar-05	249.56	250.7841667
Apr-05	247.8	250.6991667
May-05	246.32	250.605
Jun-05	244.8	249.965
Jul-05	244.07	250.3658333
Aug-05	245.57	250.2675
Sep-05	248	249.9508333
Oct-05	251.94	249.5825
Nov-05	253.6	249.3466667
Dec-05	251.12	248.9416667
Jan-06	249.07	248.5875
Feb-06	247	248.2375
Mar-06	245	247.8575
Apr-06	242.58	247.4225
May-06	240.54	246.9408333



Jun-06	239.08	246.4641667
Jul-06	237.87	245.9475
Aug-06	236.9	245.225
Sep-06	238.15	244.4041667
Oct-06	243.8	243.7258333
Nov-06	246.32	243.1191667
Dec-06	244.92	242.6025
Jan-07	242.78	242.0783333
Feb-07	240.47	241.5341667
Mar-07	238.33	240.9783333

Accra Water Balance Calculation

Waste water generation	=	Water supply	x	(1- Physical losses)	x	water return fraction
Waste water runoff	=	Waste water generation				
Waste water generation		84				
Water supply		140				
Physical losses		0.75				
water return fraction		0.8				
Net Water Supply		105				
Natural Percolation (P)	=	Rainfall (mm) x Urban Area (km2) x Fraction Permeable Area (15%)				
Rainfall		742	Rainfall in mm			
Urban Area		422	km2			
Fraction Permeable Area		0.15	%			
Natural Percolation (P)		47.0				
Evapotranspiration (natural)	=	Rainfall - (Runoff + Percolation)				
Rainfall		313	MCM			
Storm Water Runoff (SWR)		204	MCM			
Percolation		47	MCM			
Evapotranspiration (natural)		62	MCM			
Tot Evapotranspiration	=	Evapotranspiration (natural) + Human induced ET				
Tot Evapotranspiration		83				
Evapotranspiration (natural)		62	MCM			
Human induced ET		21	MCM	=	Water Supply - (Wastewater Runoff + Percolation)	
Leakage to GW from piped network		35	MCM			
Densu River run-off data						

DEN source: Personal communication from Mr. Barnabas (WRI), received in Dec

YEAR	SU 2009																								
	MAR		APR		MAY		JUNE		JULY		AUG		SEPT		OCT		NOV		DEC		JAN		FEB		
	cum ec	MC M	cume c	MC M	cum ec	MC M	cum ec	MC M	cum ec	MC M	cum ec	MC M	cum ec	MC M	cum ec	MC M	cum ec	MC M	cum ec	MC M	cum ec	MC M	cum ec	MC M	
1967-68	1.36	3.6	2.32	6.0	4.53	12.1	39.85	103.3	17.77	47.6	3.88	10.1	6.17	16.0	9.88	26.5	3.62	9.4	2.55	6.8	1.10	2.9	1.05	2.5	246.9
1968-69	1.10	3.0	3.23	8.4	8.49	22.7	46.10	119.5	68.57	183.7	58.72	152.2	64.84	168.1	40.95	109.7	19.81	51.3	7.92	21.2	3.28	8.8	2.21	5.3	853.9
1969-70	1.81	4.9	0.99	2.6	7.78	20.8	31.44	81.5	21.31	57.1	8.01	20.8	3.74	9.7	13.47	36.1	18.11	46.9	2.52	6.7	2.43	6.5	0.74	1.8	295.4
1970-71	2.77	7.4	2.15	5.6	6.74	18.1	8.41	21.8	3.79	10.2	0.62	1.6	2.01	5.2	10.22	27.4	19.739	2	1.67	4.5	1.84	4.9	1.78	4.3	130.1
1971-72	2.80	7.5	2.09	5.4	6.00	16.1	7.13	18.5	14.46	38.7	16.41	42.5	8.04	20.8	14.66	39.3	3.57	9.3	1.90	5.1	0.93	2.5	0.76	1.8	207.5
1972-73	3.45	9.2	5.32	13.8	4.70	12.6	18.40	47.7	7.81	20.9	3.31	8.6	2.43	6.3	3.31	8.9	2.09	5.4	1.36	3.6	0.71	1.9	0.23	0.6	139.5
1973-74	0.91	2.4	5.18	13.4	3.40	9.1	7.47	19.4	7.50	20.1	4.19	10.9	9.59	24.9	5.49	14.7	6.03	15.6	1.56	4.2	0.59	1.6	0.28	0.7	136.9
1974-75	2.52	6.7	2.80	7.3	6.14	16.4	10.30	26.7	11.74	31.4	7.81	20.2	NR		NR		NR		NR		NR		0.06	0.1	109.0
1975-76	2.09	5.6	1.50	3.9	4.02	10.8	8.89	23.0	22.19	59.4	2.80	7.3	1.78	4.6	4.02	10.8	3.06	7.9	1.19	3.2	0.71	1.9	1.42	3.4	141.8
1976-77	NR		6.00	15.6	NR		23.35	60.5	9.51	25.5	2.04	5.3	1.81	4.7	3.20	8.6	1.84	4.8	1.81	4.8	1.44	3.9	1.47	3.6	137.1
1977-78	1.84	4.9	NR		5.09	13.66	17.66	45.8	2.07	5.5	0.59	1.5	0.88	2.3	11.04	29.6	3.42	8.9	1.87	5.0	0.62	1.7	0.79	1.9	120.7
1978-79	2.41	6.4	NR		13.61	36.5	29.04	75.3	3.79	10.2	1.39	3.6	2.46	6.4	10.19	27.3	NR		NR		NR		NR		165.6
1979-80	NR		1.70	4.4	8.77	23.5	26.43	68.5	31.36	84.0	13.50	35.0	28.27	73.3	22.10	59.2	15.23	39.5	NR		1.61	4.3	1.56	3.8	395.4
AVERA	2.10		3.03		6.61		21.11		17.07		9.48		11.00		12.38		7.65		2.44		1.39		1.03		236.9
GE	9 % missing record																								

9 % missing record

The hydrological year is used - from Mar to Feb of the following year - eg, Mar 1967 - Feb 1968

Water and sanitation coverage data

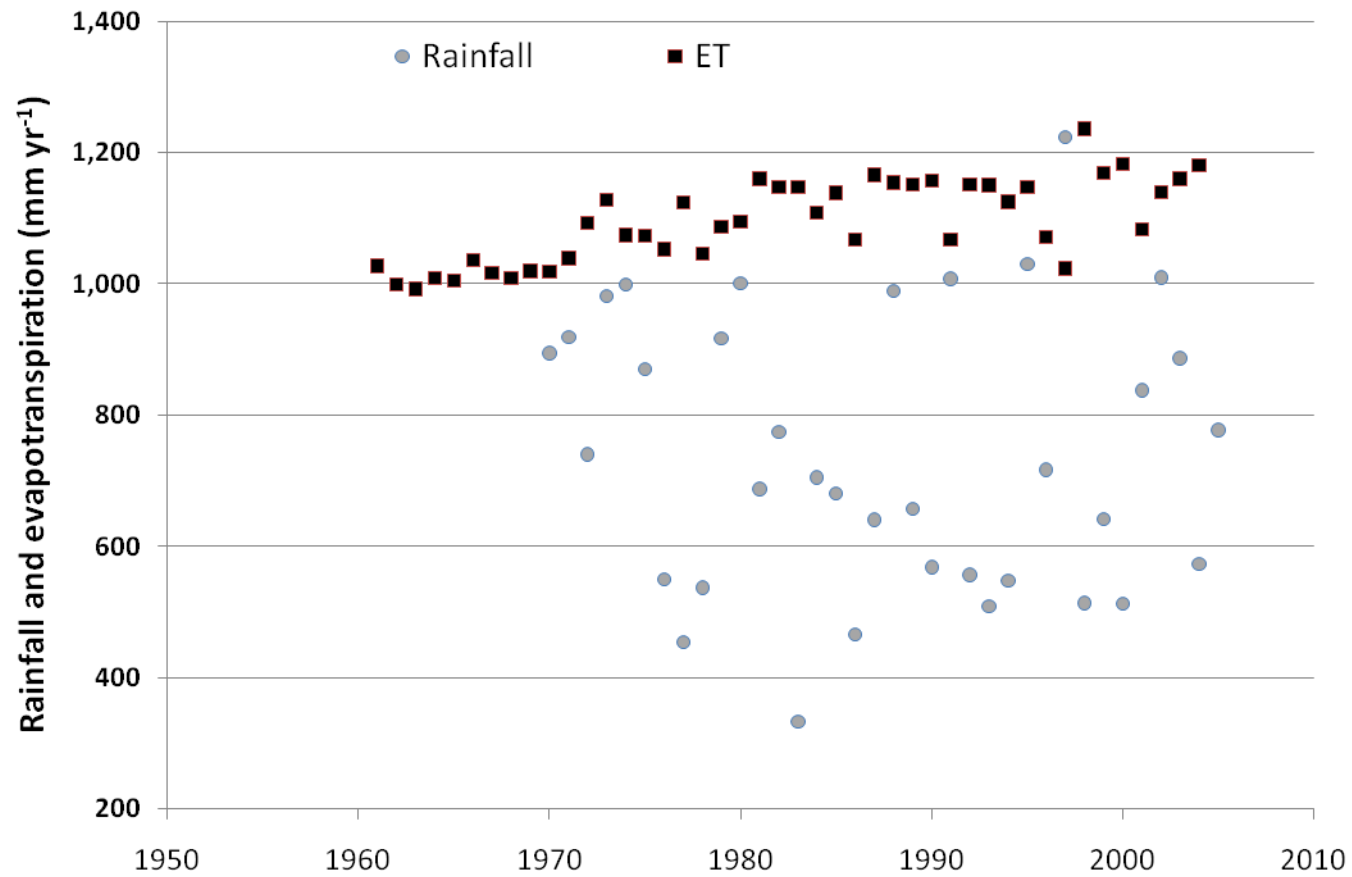
Percent distribution of households by household characteristics, according to residence, Ghana 2003

SOURCE: Demographic and health survey 2003

Household characteristic	Breakdown in %			Household characteristic	Breakdown in %			Household characteristic	Breakdown in %		
	Urban	Rural	Total		Urban	Rural	Total		Urban	Rural	Total
Electricity				Sanitation facility				Time to water source			
Yes	76.9	24.1	48.3	Flush toilet	21.2	1.7	10.7	Percentage <15 minutes	79.8	46.5	61.8
No	23.1	75.8	51.6	Traditional pit toilet	26.7	54	41.5	Median time to source	4.3	14.3	9.4
Missing	0	0.1	0.1	Ventilated improved pit latrine	40.8	13.5	26	Water availability			
Total	100	100	100	No facility, bush, field	6.7	30.6	19.6	All the time	75.9	91.9	84.5
Source of drinking water				Bucket, pan	4.5	0.2	2.2	Several hours per day	11.4	4.8	7.8
Piped into dwelling	11.5	0.7	5.7	Missing	0.1	0.1	0.1	A few times a week	9.1	1.7	5.1
Piped into compound/plot	21.9	1.2	10.7	Total	100	100	100	Less frequently	2.7	1	1.8
Public tap	39.1	8.9	22.8	Sharing toilet facilities				Not at all	0.7	0.4	0.5
Open well in dwelling/yard	2.5	1.3	1.9	No	14.6	8.6	11.4	Don't know	0.1	0	0.1
Open public well	5.9	12.8	9.6	Yes	78.5	60.8	68.9	Missing	0.1	0.2	0.2
Protected well in dwelling/yard	2.4	1.7	2	No facility	6.7	30.6	19.6	Total			
Protected public well	7.8	41.1	25.8	Missing	0.1	0.1	0.1	100.0	100	100	
Spring	0.3	0.9	0.6	Total	100.0	100					
River, stream	2	24.3	14.1	Flooring material							
Pond, lake	0.5	2.4	1.5	Earth/sand/mud	3.2	17.8	11.1				
Dam	0.1	3.7	2	Mud mixed with dung	0.1	2.4	1.3				
Rainwater	0.5	0.2	0.3	Wood/palm/bamboo/parquet	0.4	0.1	0.2				
Tanker truck	2.3	0.4	1.3	Linoleum	19.5	5.7	12				
Satchel water	3	0.3	1.5	Ceramic tiles/terrazo	3.9	0.3	2				
Other	0.4	0	0.2	Cement	54.5	71.5	63.7				
Missing	0	0.1	0.1	Carpet	18.4	2.1	9.6				
Total	100	100	100	Missing	0.1	0.1	0.1				
				Total	100	100	100				

Rainfall and Evapotranspiration in Accra

Source: WRI, Metrological station 23016ACC



Information on surface water resources of Greater Accra Region Source: WRI unpublished

WATERBODY	RIVER/ LAGOON	DATA STATIONS	LOCATION/ DISTRICT	HYDROLOGICAL DATA AVAILABILITY			BODY RESPONSIBLE FOR DATA COLLECTION	REMARKS
				TYPE OF DATA	FROM	TO		
Densu	River	Ashaladja Weija Manhia	Ga District	Flows Water Levels Flows Water levels	Dec-02 1974 1987 1978	Ongoing Ongoing 1980 Ongoing	HSD GWCL HSD HSD	Water supply/irrigation
		Nsaki Sakumo						Sakumo I lagoon
Dawchidaw	River	Afiencya Dawhenya	Ga Adangbe Ga Adangbe	Water Levels	1973	1998	GIDA	Irrigation
Jaw-wulu	River	Ashiaman	Tema	Water Levels	1968	Ongoing	GIDA	Irrigation
Lower Volta	River	Ada		Water releases from Kpong Hydro Dam			VRA	Estuary
Odaw/Onyasia	River	Korle-bu	Accra	Water Levels			HSD	Drain
Chemu								
Gao	Lagoon			Nil			Nil	
Korle	Lagoon	Korle-bu		Nil				Ecologically dead
Kpeshi				Nil				Receives effluents/raw waste
Laivi	Lagoon			Nil			Nil	
Sakumo I	Lagoon	Weija		Nil				Fishing
Sakumo II	Lagoon			Nil				Ramsar Site/fishing
Songhor	Lagoon			Nil			Nil	Salt Industry/fishing

Appendix E. Data: Case Addis Ababa

Population data for Addis Ababa

CSA = Central statistical authority of Ethiopia

		UN	CSA			UN historical interpolated
	CSA (in Tahal 2005)		LOW	MEDIUM	HIGH	
1950		392,000				392,000
1951						403,148
1952						414,612
1953						426,403
1954						438,529
1955		451,000				
1956						463,847
1957						477,060
1958						490,649
1959						504,626
1960		519,000				519,000
1961	443,728					533,739
1962						548,896
1963						564,484
1964						580,515
1965		597,000				597,000
1966						621,334
1967	683,530					646,659
1968						673,017
1969						700,449
1970		729,000				729,000
1971						764,723
1972						802,197
1973						841,507
1974						882,743
1975		926,000				926,000
1976						971,173
1977						1,018,549
1978	1,167,315					1,068,236
1979						1,120,347
1980		1,175,000				1,175,000
1981						1,229,837
1982						1,287,233
1983						1,347,308
1984	1,423,111					1,410,187
1985		1,476,000				1,476,000
1986						1,534,222
1987						1,594,741
1988						1,657,646
1989						1,723,034
1990		1,791,000				1,791,000
1991						1,858,859
1992						1,929,290
1993						2,002,388
1994	2,112,737					2,078,257
1995		2,157,000	2,157,000	2,157,000	2,157,000	2,157,000
1996			2,222,000	2,220,000	2,222,000	
1997			2,287,000	2,286,000	2,291,000	
1998			2,354,000	2,354,000	2,362,000	
1999			2,423,000	2,424,000	2,437,000	
2000		2,493,000	2,493,000	2,495,000	2,516,000	
2001			2,565,000	2,570,000	2,599,000	
2002			2,638,000	2,646,000	2,686,000	
2003			2,712,000	2,725,000	2,777,000	
2004			2,788,000	2,805,000	2,870,000	
2005		2,902,000	2,864,000	2,887,000	2,969,000	
2006			2,940,000	2,973,000	3,071,000	
2007			3,020,000	3,059,000	3,177,000	
2008			3,099,000	3,147,000	3,288,000	
2009			3,179,000	3,237,000	3,401,000	UN FORCAST
2010			3,257,000	3,328,000	3,517,000	3,453,000
2011			3,336,000	3,418,000	3,637,000	
2012			3,415,000	3,512,000	3,759,000	
2013			3,494,000	3,605,000	3,885,000	
2014			3,572,000	3,699,000	4,012,000	

2015			3,647,000	3,792,000	4,143,000	4,184,000
2016			3,722,000	3,883,000	4,274,000	
2017			3,794,000	3,975,000	4,408,000	
2018			3,866,000	4,067,000	4,544,000	
2019			3,935,000	4,157,000	4,680,000	
2020			4,003,000	4,246,000	4,817,000	5,083,000
2021			4,068,000	4,332,000	4,952,000	
2022			4,131,000	4,416,000	5,088,000	
2023			4,193,000	4,499,000	5,225,000	
2024			4,254,000	4,581,000	5,362,000	
2025			4,312,000	4,664,000	5,503,000	6,156,000
2026			4,370,000	4,748,000	5,645,000	
2027			4,426,000	4,831,000	5,789,000	
2028			4,482,000	4,914,000	5,935,000	
2029			4,536,000	5,000,000	6,084,000	
2030			4,589,000	5,087,000	6,236,000	

built-up area Addis Ababa

Period	Additional Area Covered	Total built-up area		Annual Growth rate
	ha.	ha.	km2	%
1886–1936	1,863	1,863	19	-
1937–1975	4,187	6,050	61	3.1
1976–1985	4,788	10,838	108	6
1986–1995	2,925	13,763	138	2.4
1996–2000	909	14,673	147	1.6
Source: Based on data obtained from ORAAMP (2001:17–18).				

Water Supply

year	Entoto	Gafersa constr	Gafersa exp.	Legadadi Constr.	Legadadi expansion	urban wells	Akaki wells	Silibu & Gerbi I	Silibu & Gerbi expansion	cum	Gaf tot	Leg tot	Sib & Ger tot	GW TOT	% of tot
1938	1	0	0	0	0	0	0	0	0	1	0	0	0	0	0.0
1939	1	0	0	0	0	0	0	0	0	1	0	0	0	0	0.0
1940	1	0	0	0	0	0	0	0	0	1	0	0	0	0	0.0
1941	1	0	0	0	0	0	0	0	0	1	0	0	0	0	0.0
1942	1	0	0	0	0	0	0	0	0	1	0	0	0	0	0.0
1943	1	0	0	0	0	0	0	0	0	1	0	0	0	0	0.0
1944	1	0	0	0	0	0	0	0	0	1	0	0	0	0	0.0
1945	1	0	0	0	0	0	0	0	0	1	0	0	0	0	0.0
1946	1	0	0	0	0	0	0	0	0	1	0	0	0	0	0.0
1947	1	0	0	0	0	0	0	0	0	1	0	0	0	0	0.0
1948	1	0	0	0	0	0	0	0	0	1	0	0	0	0	0.0
1949	1	0	0	0	0	0	0	0	0	1	0	0	0	0	0.0
1950	1	0	0	0	0	0	0	0	0	1	0	0	0	0	0.0
1951	1	0	0	0	0	0	0	0	0	1	0	0	0	0	0.0
1952	1	0	0	0	0	0	0	0	0	1	0	0	0	0	0.0
1953	1	0	0	0	0	0	0	0	0	1	0	0	0	0	0.0
1954	1	5	0	0	0	0	0	0	0	6	5.48	0	0	0	0.0
1955	1	5	0	0	0	0	0	0	0	6	5.48	0	0	0	0.0
1956	1	5	0	0	0	0	0	0	0	6	5.48	0	0	0	0.0
1957	1	5	0	0	0	0	0	0	0	6	5.48	0	0	0	0.0
1958	1	5	0	0	0	0	0	0	0	6	5.48	0	0	0	0.0
1959	1	5	0	0	0	0	0	0	0	6	5.48	0	0	0	0.0
1960	1	5	5	0	0	0	0	0	0	11	10.5	0	0	0	0.0
1961	1	5	5	0	0	0	0	0	0	11	10.5	0	0	0	0.0
1962	1	5	5	0	0	0	0	0	0	11	10.5	0	0	0	0.0
1963	1	5	5	0	0	0	0	0	0	11	10.5	0	0	0	0.0
1964	1	5	5	0	0	0	0	0	0	11	10.5	0	0	0	0.0
1965	1	5	5	0	0	0	0	0	0	11	10.5	0	0	0	0.0
1966	1	5	5	0	0	0	0	0	0	11	10.5	0	0	0	0.0
1967	1	5	5	0	0	0	0	0	0	11	10.5	0	0	0	0.0
1968	1	5	5	0	0	0	0	0	0	11	10.5	0	0	0	0.0
1969	1	5	5	0	0	0	0	0	0	11	10.5	0	0	0	0.0
1970	1	5	5	18	0	0	0	0	0	30	10.5	18.3	0	0	0.0
1971	1	5	5	18	0	0	0	0	0	30	10.5	18.3	0	0	0.0
1972	1	5	5	18	0	0	0	0	0	30	10.5	18.3	0	0	0.0
1973	1	5	5	18	0	0	0	0	0	30	10.5	18.3	0	0	0.0
1974	1	5	5	18	0	0	0	0	0	30	10.5	18.3	0	0	0.0
1975	1	5	5	18	0	0	0	0	0	30	10.5	18.3	0	0	0.0
1976	1	5	5	18	0	0	0	0	0	30	10.5	18.3	0	0	0.0
1977	1	5	5	18	0	0	0	0	0	30	10.5	18.3	0	0	0.0
1978	1	5	5	18	0	0	0	0	0	30	10.5	18.3	0	0	0.0
1979	1	5	5	18	0	0	0	0	0	30	10.5	18.3	0	0	0.0
1980	1	5	5	18	0	0	0	0	0	30	10.5	18.3	0	0	0.0
1981	1	5	5	18	0	0	0	0	0	30	10.5	18.3	0	0	0.0
1982	1	5	5	18	0	0	0	0	0	30	10.5	18.3	0	0	0.0
1983	1	5	5	18	0	0	0	0	0	30	10.5	18.3	0	0	0.0
1984	1	5	5	18	0	0	0	0	0	30	10.5	18.3	0	0	0.0
1985	1	5	5	18	0	0	0	0	0	30	10.5	18.3	0	0	0.0
1986	1	5	5	18	37	0	0	0	0	66	10.5	54.8	0	0	0.0
1987	1	5	5	18	37	0	0	0	0	66	10.5	54.8	0	0	0.0
1988	1	5	5	18	37	0	0	0	0	66	10.5	54.8	0	0	0.0
1989	1	5	5	18	37	0	0	0	0	66	10.5	54.8	0	0	0.0
1990	1	5	5	18	37	0	0	0	0	66	10.5	54.8	0	0	0.0
1991	1	5	5	18	37	0	0	0	0	66	10.5	54.8	0	0	0.0
1992	1	5	5	18	37	0	0	0	0	66	10.5	54.8	0	0	0.0
1993	1	5	5	18	37	0	0	0	0	66	10.5	54.8	0	0	0.0
1994	1	5	5	18	37	0	0	0	0	66	10.5	54.8	0	0	0.0
1995	1	5	5	18	37	5	0	0	0	71	10.5	54.8	0	4.745	6.7

1996	1	5	5	18	37	5	0	0	0	71	10.5	54.8	0	4.745	6.7
1997	1	5	5	18	37	5	0	0	0	71	10.5	54.8	0	4.745	6.7
1998	1	5	5	18	37	5	0	0	0	71	10.5	54.8	0	4.745	6.7
1999	1	5	5	18	37	5	0	0	0	71	10.5	54.8	0	4.745	6.7
2000	1	5	5	18	37	5	0	0	0	71	10.5	54.8	0	4.745	6.7
2001	1	5	5	18	37	5	20	0	0	91	10.5	54.8	0	24.82	27.3
2002	1	5	5	18	37	5	20	0	0	91	10.5	54.8	0	24.82	27.3
2003	1	5	5	18	37	5	20	0	0	91	10.5	54.8	0	24.82	27.3
2004	1	5	5	18	37	5	20	0	0	91	10.5	54.8	0	24.82	27.3
2005	1	5	5	18	37	5	20	0	0	91	10.5	54.8	0	24.82	27.3
2006	1	5	5	18	37	5	20	0	0	91	10.5	54.8	0	24.82	27.3
2007	1	5	5	18	37	5	20	0	0	91	10.5	54.8	0	24.82	27.3
2008	1	5	5	18	37	5	20	0	0	91	10.5	54.8	0	24.82	27.3
2009	1	5	5	18	37	5	20	0	0	91	10.5	54.8	0	24.82	27.3
2010	1	5	5	18	37	5	20	0	0	91	10.5	54.8	0	24.82	27.3
2011	1	5	5	18	37	5	20	150	0	241	10.5	54.8	150	24.82	10.3
2012	1	5	5	18	37	5	20	150	0	241	10.5	54.8	150	24.82	10.3
2013	1	5	5	18	37	5	20	150	0	241	10.5	54.8	150	24.82	10.3
2014	1	5	5	18	37	5	20	150	0	241	10.5	54.8	150	24.82	10.3
2015	1	5	5	18	37	5	20	150	0	241	10.5	54.8	150	24.82	10.3
2016	1	5	5	18	37	5	20	150	77	318	10.5	54.8	227	24.82	7.8
2017	1	5	5	18	37	5	20	150	77	318	10.5	54.8	227	24.82	7.8
2018	1	5	5	18	37	5	20	150	77	318	10.5	54.8	227	24.82	7.8
2019	1	5	5	18	37	5	20	150	77	318	10.5	54.8	227	24.82	7.8
2020	1	5	5	18	37	5	20	150	77	318	10.5	54.8	227	24.82	7.8

Water and sanitation coverage data Addis Ababa

distribution of households by toilet facilities in Addis Source: World Bank (2007)				
	(%)			
Flush Toilet	12			
Individual or shared pit latrines	63			
No access to Facilities	25			
Kebbede, G. (2004). Living with urban environmental health risks.				
distribution of households by toilet facilities in Addis in 1998				
	(%)			
flush toilet	11			
pit latrine	73			
container/hh items	3			
field/forest	11			
other?	2			
source: CSA 2004		Distribution of HH by toilet facility in 2004,		
	Addis region, urban	Country level, urban		
Toilet facility	(%)	(%)		
Other	1	7		
container /household item	1	64.6		
field/forest	6	0.7		
flush toilet	17	26.9		
pit latrine	75	0.8		
CSA 1994 in ENECO 2002				
distribution of toilets by housing unit Addis Ababa				
Toilet facility	%			
flush toilet private	8			
flush toilet shared	4			
pit latrine private	18			
pit latrine shared	45			
no toilet	24			
not stated	1			
total	100			
CSA. 2005. Welfare monitoring survey 2004 Vol2. Table 8.4(a): Distribution of Housholds by type of Toilet Facility and Region - Country Level - 2004				
	Country total	Country total	Addis	Addis
	Number	Fraction (%)	Number	Fraction (%)
Flush toilet	335,314	2	83,574	17
Pit latrine	3,784,209	28	366,875	74
Container /household item	29,704	0	4,235	1
Field/forest	9,267,497	69	34,318	7
Others	24,756	0	3,954	1
Not stated	6,528	0	657	0
total	13,448,008		493,613	
calc	13,448,008	99.99	493,613	1
Mboup G 2004. Urban Inequities Survey Addis Ababa 2003 (ppt). Addis Ababa.				
Graph 2.1: Distribution of households by type of toilet facility (Addis UIS, 2003)				
		(%)		
Flush to sewage system		4		
Non-flush latrine to sewage system		10		
Dug pit latrine		68		
Traditional pit latrine		8		
None		10		

Rainfall and Evapotranspiration

Due to large size only a sample is shown.

Loc	Day	Month	Year	Rain	Evap
SHLA	1	6	1981	0	20
SHLA	2	6	1981	0	80
SHLA	3	6	1981	0	14
SHLA	4	6	1981	0	80
SHLA	5	6	1981	13	82
SHLA	6	6	1981	0	50
SHLA	7	6	1981	4	95
SHLA	8	6	1981	0	89
SHLA	9	6	1981	0	103
SHLA	10	6	1981	0	77
SHLA	11	6	1981	0	66
SHLA	12	6	1981	0	41
SHLA	13	6	1981	25	57
SHLA	14	6	1981	3	0
SHLA	15	6	1981	0	0
SHLA	16	6	1981	0	0
SHLA	17	6	1981	0	0
SHLA	18	6	1981	0	56
SHLA	19	6	1981	0	21
SHLA	20	6	1981	47	69
SHLA	21	6	1981	278	27
SHLA	22	6	1981	25	20
SHLA	23	6	1981	21	16
SHLA	24	6	1981	15	18
SHLA	25	6	1981	45	12
SHLA	26	6	1981	101	11
SHLA	27	6	1981	5	61
SHLA	28	6	1981	0	12
SHLA	29	6	1981	38	24
SHLA	30	6	1981	0	31
				62.0	4.1
SHLA	1	7	1981	3	10
SHLA	2	7	1981	90	11
SHLA	3	7	1981	110	12
SHLA	4	7	1981	10	12
SHLA	5	7	1981	63	11
SHLA	6	7	1981	24	11
SHLA	7	7	1981	149	12
SHLA	8	7	1981	0	9
SHLA	9	7	1981	61	9
SHLA	10	7	1981	43	10
SHLA	11	7	1981	26	5
SHLA	12	7	1981	7	10
SHLA	13	7	1981	33	5
SHLA	14	7	1981	22	9
SHLA	15	7	1981	27	8
SHLA	16	7	1981	62	8

SHLA	17	7	1981	90	0
SHLA	18	7	1981	160	0
SHLA	19	7	1981	51	46
SHLA	20	7	1981	72	0
SHLA	21	7	1981	134	0
SHLA	22	7	1981	69	35
SHLA	23	7	1981	75	48
SHLA	24	7	1981	173	0
SHLA	25	7	1981	88	12
SHLA	26	7	1981	165	0
SHLA	27	7	1981	13	115
SHLA	28	7	1981	92	0
SHLA	29	7	1981	271	0
SHLA	30	7	1981	22	80
SHLA	31	7	1981	74	0
				227.9	1.6

SHLA	1	8	1981	38	51
SHLA	2	8	1981	10	0
SHLA	3	8	1981	90	0
SHLA	4	8	1981	103	0
SHLA	5	8	1981	117	0
SHLA	6	8	1981	141	0
SHLA	7	8	1981	152	3
SHLA	8	8	1981	60	66
SHLA	9	8	1981	126	10
SHLA	10	8	1981	1	72
SHLA	11	8	1981	138	0
SHLA	12	8	1981	104	6
SHLA	13	8	1981	5	67
SHLA	14	8	1981	72	74
SHLA	15	8	1981	88	48
SHLA	16	8	1981	168	0
SHLA	17	8	1981	6	174
SHLA	18	8	1981	0	48
SHLA	19	8	1981	145	0
SHLA	20	8	1981	10	40
SHLA	21	8	1981	20	16
SHLA	22	8	1981	2	39
SHLA	23	8	1981	148	0
SHLA	24	8	1981	108	0
SHLA	25	8	1981	140	0
SHLA	26	8	1981	21	73
SHLA	27	8	1981	177	0
SHLA	28	8	1981	3	104
SHLA	29	8	1981	381	0
SHLA	30	8	1981	64	8
SHLA	31	8	1981	140	0
				277.8	2.9

Water demand data

Source: Tahal

YEAR	Mode of service				Residential demand (l/cap-day)		
	HC (%)	ycs (%)	ycc(%)	pf(%)	High	Medium	Low
1994	4.43	22.43	25.57	45.33			
2011	30	30	20	20	86	77	70
2020	40	35	15	10	118	102	88
2025	50	35	10	5	153	128	108

Unaccounted for water (UFW) has been considered to be 30% of residential demand
Public, institutional and commercial demands 30% of the residential demand

YEAR	Domestic demand (l/cap-day)			Industrial demand	
	High	Medium	Low	(m3/day-ha)	Supply (%)
2011	138	123	111	30	15
2020	189	163	141	40	30
2025	244	205	172	45	50

The various scenarios of development are given in the table below and in the Chart

YEAR	Water Demand (l/cap/day)				
	SCENARIO 1	SCENARIO 2	SCENARIO 3	SCENARIO 4	AE-HBT AGRA
1994	98	98	98	98	98
2002	123	123	123	123	123
2006	137	140	133	133	130
2011	155	161	145	145	152
2020	169	192	154	151	191
2025	195	229	176	165	

YEAR	Water Demand (m3/day)				
	SCENARIO 1	SCENARIO 2	SCENARIO 3	SCENARIO 4	AE-HBT AGRA
1994	206,230	206,230	206,230	206,230	206,230
2002	326,137	326,137	326,137	326,137	326,137
2006	444,657	455,013	428,525	427,861	432,063
2011	592,808	616,108	556,509	555,016	655,191
2020	863,949	978,231	786,867	771,298	1,056,821
2025	1,133,883	1,329,585	1,021,290	956,614	

Appendix F. Data: Case Hyderabad

Population data Hyderabad

year	population	annual growth rate	year	population	annual growth rate
1950	1,122,000	(determined every 5 years)	1990	4,193,000	(determined every 5 years)
1951	1,135,464	0.0120	1991	4,331,369	0.0330
1952	1,149,090		1992	4,474,304	
1953	1,162,879		1993	4,621,956	
1954	1,176,833		1994	4,774,481	
1955	1,181,000		1995	4,825,000	
1956	1,195,172	0.0120	1996	4,960,100	0.0280
1957	1,209,514		1997	5,098,983	
1958	1,224,028		1998	5,241,754	
1959	1,238,717		1999	5,388,523	
1960	1,243,000		2000	5,445,000	
1961	1,284,019	0.0330	2001	5,717,250	
1962	1,326,392		2002	6,003,113	
1963	1,370,163		2003	6,303,268	
1964	1,415,378		2004	6,618,432	
1965	1,462,000		2005	7,140,000	estimations..
1966	1,517,556	0.0380	2006	7,497,000	
1967	1,575,223		2007	7,841,862	
1968	1,635,082		2008	8,171,220	
1969	1,697,215		2009	8,481,727	
1970	1,749,000		2010	8,770,105	
1971	1,818,086	0.0395	2011	9,033,208	
1972	1,889,900		2012	9,304,205	
1973	1,964,551		2013	9,583,331	
1974	2,042,151		2014	9,870,831	
1975	2,086,000		2015	10,166,956	
1976	2,171,526	0.0410	2016	10,471,964	
1977	2,260,559		2017	10,786,123	
1978	2,353,241		2018	11,109,707	
1979	2,449,724		2019	11,442,998	
1980	2,487,000		2020	11,786,288	
1981	2,591,454	0.0420	2021	12,139,877	
1982	2,700,295		2022	12,504,073	
1983	2,813,707		2023	12,879,195	
1984	2,931,883		2024	13,265,571	
1985	3,210,000		2025	13,663,538	
1986	3,351,240	0.0440	2026	14,073,444	
1987	3,498,695		2027	14,495,648	
1988	3,652,637		2028	14,930,517	
1989	3,813,353		2029	15,378,433	
			2030	15,839,786	

Built-up area Hyderabad

LAND USE/ LAND COVER	1971	1981	1991	2001	1971	1981	1991	2001
	%	%	%	%	km2	km2	km2	km2
Mixed Built (Residential & Commercial)	22.56	32.11	32.31	37.35	175.6	249.9	251.4	290.6
Layout	0.64	0.58	1.33	5.5	5.0	4.5	10.3	42.8
Airport and other Transportation	0.2	0.81	0.48	0.48	1.6	6.3	3.7	3.7
Industrial	0	0	3.84	5.58	0.0	0.0	29.9	43.4
Crop land	6.43	6.21	9.36	9.36	50.0	48.3	72.8	72.8
Plantation	0	0	1.19	1.19	0.0	0.0	9.3	9.3
Forest	0.15	0.15	1.44	1.44	1.2	1.2	11.2	11.2
Parks/Gardens/Public-semi public	2.77	2.77	7.07	7.07	21.6	21.6	55.0	55.0
Barren Rocky	3.12	3.12	1.21	1.21	24.3	24.3	9.4	9.4
Scrubland/grasses	56.09	46.22	4.31	1.99	436.5	359.7	33.5	15.5
Brick kilns and others	0	0	0.64	1.22	0.0	0.0	5.0	9.5
Open Land	3.16	3.16	26.05	16.85	24.6	24.6	202.7	131.1
Defence land	0	0	7.19	7.19	0.0	0.0	56.0	56.0
Water	4.86	4.86	3.59	3.59	37.8	37.8	27.9	27.9
Total Area in sq km (100%)	778	778	778	778	778.0	778.1	778.2	778.3
total calculated	95	95	96	96	740	740	750	750
	1971	1981	1991	2001	1971	1981	1991	2001
Paved	23	34	38	49	182.1	260.7	295.4	380.6
Unpaved	72	62	58	48	558.1	479.6	454.9	369.8
Water	5	5	4	4	37.8	37.8	27.9	27.9
total	100.0	100.0	100.0	100.0	778.0	778.1	778.2	778.3

In: Iyer, N. K., S. Kulkarni, et al. (2007). Economy, population and urban sprawl. A comparative study of urban agglomerations of Bangalore and Hyderabad

DATA for HUA (Hyderabad Urban Agglomeration)

Water Supply to Hyderabad

year of start:			1910			1927			1994			1960			2004			2,021					
year	Ground Water		%	Osman Sagar		%	Himayat Sagar		%	Singur		%	Manjira		%	Krishna river		%	Godavari			Tot Supply	
	m3/month	MCM/yr		m3/month	MCM/yr		m3/month	MCM/yr		m3/month	MCM/yr		m3/month	MCM/yr		m3/month	MCM/yr		m3/month	MCM/yr		m3/month	MCM/yr
1950	212,459	3	6%	1,930,554	23	52%	1,589,868	19	43%	0	0	0%	0	0	0%	0	0	0%	0	0	0%	3,732,881	45
1951	223,641	3	6%	1,930,554	23	52%	1,589,868	19	42%	0	0	0%	0	0	0%	0	0	0%	0	0	0%	3,744,063	45
1952	235,411	3	6%	1,930,554	23	51%	1,589,868	19	42%	0	0	0%	0	0	0%	0	0	0%	0	0	0%	3,755,833	45
1953	247,801	3	7%	1,930,554	23	51%	1,589,868	19	42%	0	0	0%	0	0	0%	0	0	0%	0	0	0%	3,768,223	45
1954	260,843	3	7%	1,930,554	23	51%	1,589,868	19	42%	0	0	0%	0	0	0%	0	0	0%	0	0	0%	3,781,265	45
1955	274,572	3	7%	1,930,554	23	51%	1,589,868	19	42%	0	0	0%	0	0	0%	0	0	0%	0	0	0%	3,794,994	46
1956	289,023	3	8%	1,930,554	23	51%	1,589,868	19	42%	0	0	0%	0	0	0%	0	0	0%	0	0	0%	3,809,445	46
1957	304,235	4	8%	1,930,554	23	50%	1,589,868	19	42%	0	0	0%	0	0	0%	0	0	0%	0	0	0%	3,824,657	46
1958	320,247	4	8%	1,930,554	23	50%	1,589,868	19	41%	0	0	0%	0	0	0%	0	0	0%	0	0	0%	3,840,669	46
1959	337,102	4	9%	1,930,554	23	50%	1,589,868	19	41%	0	0	0%	0	0	0%	0	0	0%	0	0	0%	3,857,524	46
1960	354,845	4	4%	1,930,554	23	21%	1,589,868	19	17%	0	0	0%	5,450,976	65	58%	0	0	0%	0	0	0%	9,326,243	112
1961	373,521	4	4%	1,930,554	23	21%	1,589,868	19	17%	0	0	0%	5,450,976	65	58%	0	0	0%	0	0	0%	9,344,919	112
1962	393,180	5	4%	1,930,554	23	21%	1,589,868	19	17%	0	0	0%	5,450,976	65	58%	0	0	0%	0	0	0%	9,364,578	112
1963	413,873	5	4%	1,930,554	23	21%	1,589,868	19	17%	0	0	0%	5,450,976	65	58%	0	0	0%	0	0	0%	9,385,271	113
1964	435,656	5	5%	1,930,554	23	21%	1,589,868	19	17%	0	0	0%	5,450,976	65	58%	0	0	0%	0	0	0%	9,407,054	113
1965	458,585	6	5%	1,930,554	23	20%	1,589,868	19	17%	0	0	0%	5,450,976	65	58%	0	0	0%	0	0	0%	9,429,983	113
1966	482,722	6	5%	1,930,554	23	20%	1,589,868	19	17%	0	0	0%	5,450,976	65	58%	0	0	0%	0	0	0%	9,454,120	113
1967	508,128	6	5%	1,930,554	23	20%	1,589,868	19	17%	0	0	0%	5,450,976	65	58%	0	0	0%	0	0	0%	9,479,526	114
1968	534,872	6	6%	1,930,554	23	20%	1,589,868	19	17%	0	0	0%	5,450,976	65	57%	0	0	0%	0	0	0%	9,506,270	114
1969	563,023	7	6%	1,930,554	23	20%	1,589,868	19	17%	0	0	0%	5,450,976	65	57%	0	0	0%	0	0	0%	9,534,421	114
1970	592,655	7	6%	1,930,554	23	20%	1,589,868	19	17%	0	0	0%	5,450,976	65	57%	0	0	0%	0	0	0%	9,564,053	115
1971	623,848	7	7%	1,930,554	23	20%	1,589,868	19	17%	0	0	0%	5,450,976	65	57%	0	0	0%	0	0	0%	9,595,246	115
1972	656,682	8	7%	1,930,554	23	20%	1,589,868	19	17%	0	0	0%	5,450,976	65	57%	0	0	0%	0	0	0%	9,628,080	116
1973	691,244	8	7%	1,930,554	23	20%	1,589,868	19	16%	0	0	0%	5,450,976	65	56%	0	0	0%	0	0	0%	9,662,642	116
1974	727,625	9	8%	1,930,554	23	20%	1,589,868	19	16%	0	0	0%	5,450,976	65	56%	0	0	0%	0	0	0%	9,699,023	116
1975	765,921	9	8%	1,930,554	23	20%	1,589,868	19	16%	0	0	0%	5,450,976	65	56%	0	0	0%	0	0	0%	9,737,319	117
1976	806,233	10	8%	1,930,554	23	20%	1,589,868	19	16%	0	0	0%	5,450,976	65	56%	0	0	0%	0	0	0%	9,777,631	117
1977	848,666	10	9%	1,930,554	23	20%	1,589,868	19	16%	0	0	0%	5,450,976	65	56%	0	0	0%	0	0	0%	9,820,064	118

1978	893,333	11	9%	1,930,554	23	20%	1,589,868	19	16%	0	0	0%	5,450,976	65	55%	0	0	0%	0	0	0%	9,864,731	118
1979	940,351	11	9%	1,930,554	23	19%	1,589,868	19	16%	0	0	0%	5,450,976	65	55%	0	0	0%	0	0	0%	9,911,749	119
1980	989,843	12	13%	2,839,050	34	36%	2,271,240	27	29%	0	0	0%	1,703,430	20	22%	0	0	0%	0	0	0%	7,803,563	94
1981	1,041,940	13	13%	2,839,050	34	36%	2,271,240	27	29%	0	0	0%	1,703,430	20	22%	0	0	0%	0	0	0%	7,855,660	94
1982	1,096,779	13	11%	2,839,050	34	28%	2,271,240	27	22%	0	0	0%	4,088,232	49	40%	0	0	0%	0	0	0%	10,295,301	124
1983	1,154,504	14	10%	2,839,050	34	25%	2,498,364	30	22%	0	0	0%	4,883,166	59	43%	0	0	0%	0	0	0%	11,375,084	137
1984	1,215,267	15	12%	2,271,240	27	23%	1,703,430	20	17%	0	0	0%	4,769,604	57	48%	0	0	0%	0	0	0%	9,959,541	120
1985	1,279,229	15	13%	2,271,240	27	23%	1,703,430	20	17%	0	0	0%	4,769,604	57	48%	0	0	0%	0	0	0%	10,023,503	120
1986	1,346,557	16	26%	1,135,620	14	22%	908,496	11	18%	0	0	0%	1,703,430	20	33%	0	0	0%	0	0	0%	5,094,103	61
1987	1,417,428	17	27%	1,135,620	14	22%	908,496	11	18%	0	0	0%	1,703,430	20	33%	0	0	0%	0	0	0%	5,164,974	62
1988	1,492,029	18	17%	1,552,014	19	18%	1,552,014	19	18%	0	0	0%	3,993,597	48	46%	0	0	0%	0	0	0%	8,589,654	103
1989	1,570,557	19	13%	3,179,736	38	27%	2,498,364	30	21%	0	0	0%	4,542,480	55	39%	0	0	0%	0	0	0%	11,791,137	141
1990	1,653,218	20	14%	3,179,736	38	27%	2,498,364	30	21%	0	0	0%	4,542,480	55	38%	0	0	0%	0	0	0%	11,873,798	142
1991	1,740,230	21	14%	3,094,565	37	25%	2,441,583	29	19%	567,810	7	5%	4,684,433	56	37%	0	0	0%	0	0	0%	12,528,620	150
1992	1,831,821	22	13%	2,469,974	30	18%	2,157,678	26	16%	2,271,240	27	16%	5,110,290	61	37%	0	0	0%	0	0	0%	13,841,002	166
1993	1,928,232	23	18%	529,956	6	5%	832,788	10	8%	2,574,072	31	23%	5,110,290	61	47%	0	0	0%	0	0	0%	10,975,338	132
1994	2,029,718	24	17%	416,394	5	4%	264,978	3	2%	3,936,816	47	33%	5,110,290	61	43%	0	0	0%	0	0	0%	11,758,196	141
1995	2,136,545	26	18%	567,810	7	5%	227,124	3	2%	4,021,988	48	34%	4,873,703	58	41%	0	0	0%	0	0	0%	11,827,169	142
1996	2,248,995	27	12%	1,703,430	20	9%	2,839,050	34	15%	6,813,720	82	36%	5,110,290	61	27%	0	0	0%	0	0	0%	18,715,485	225
1997	2,367,363	28	13%	1,798,065	22	10%	2,460,510	30	14%	6,435,180	77	36%	4,826,385	58	27%	0	0	0%	0	0	0%	17,887,503	215
1998	2,491,962	30	15%	2,322,501	28	14%	1,498,388	18	9%	5,804,280	70	35%	4,365,039	52	26%	0	0	0%	0	0	0%	16,482,169	198
1999	2,623,117	31	14%	2,839,050	34	15%	1,703,430	20	9%	6,813,720	82	36%	5,110,290	61	27%	0	0	0%	0	0	0%	19,089,607	229
2000	2,761,176	33	14%	2,839,050	34	15%	1,703,430	20	9%	6,813,720	82	35%	5,106,031	61	27%	0	0	0%	0	0	0%	19,223,408	231
2001	2,906,501	35	14%	2,839,050	34	14%	1,938,503	23	9%	8,043,596	97	39%	5,106,031	61	25%	0	0	0%	0	0	0%	20,833,682	250
2002	3,059,475	37	14%	2,994,346	36	14%	1,938,503	23	9%	8,043,596	97	38%	5,106,031	61	24%	0	0	0%	0	0	0%	21,141,952	254
2003	3,220,500	39	18%	557,400	7	3%	1,141,298	14	6%	8,151,859	98	45%	5,110,290	61	28%	0	0	0%	0	0	0%	18,181,347	218
2004	3,390,000	41	MCM	1,022,058	12	MCM	1,022,058	12	MCM	8,517,150	102	MCM	5,110,290	61	MCM	5,110,290	61	MCM	0	0	MCM	24,171,846	290
2005	3,491,700	42	42	1,930,554	23	23	1,589,868	19	19	8,994,962	108	108	5,450,976	65	65	10,220,580	123	123	0	0	0	31,678,640	380
2006	3,596,451	43	11%	1,930,554	23	6%	1,589,868	19	5%	8,994,962	108	28%	5,450,976	65	17%	10,220,580	123	32%	0	0	0%	31,783,391	381
2007	3,704,345	44	12%	1,930,554	23	6%	1,589,868	19	5%	8,994,962	108	28%	5,450,976	65	17%	10,220,580	123	32%	0	0	0%	31,891,285	383
2008	3,815,475	46	12%	1,930,554	23	6%	1,589,868	19	5%	8,994,962	108	28%	5,450,976	65	17%	10,220,580	123	32%	0	0	0%	32,002,415	384
2009	3,929,939	47	12%	1,930,554	23	6%	1,589,868	19	5%	8,994,962	108	28%	5,450,976	65	17%	10,220,580	123	32%	0	0	0%	32,116,879	385
2010	4,047,837	49	13%	1,930,554	23	6%	1,589,868	19	5%	8,994,962	108	28%	5,450,976	65	17%	10,220,580	123	32%	0	0	0%	32,234,777	387
2011	4,169,272	50	13%	1,930,554	23	6%	1,589,868	19	5%	8,994,962	108	28%	5,450,976	65	17%	10,220,580	123	32%	0	0	0%	32,356,213	388
2012	4,294,351	52	10%	1,930,554	23	5%	1,589,868	19	4%	8,994,962	108	21%	5,450,976	65	13%	20,441,160	245	48%	0	0	0%	42,701,871	512

2013	4,423,181	53	10%	1,930,554	23	5%	1,589,868	19	4%	8,994,962	108	21%	5,450,976	65	13%	20,441,160	245	48%	0	0	0%	42,830,701	514
2014	4,555,877	55	11%	1,930,554	23	4%	1,589,868	19	4%	8,994,962	108	21%	5,450,976	65	13%	20,441,160	245	48%	0	0	0%	42,963,397	516
2015	4,692,553	56	11%	1,930,554	23	4%	1,589,868	19	4%	8,994,962	108	21%	5,450,976	65	13%	20,441,160	245	47%	0	0	0%	43,100,073	517
2016	4,833,329	58	11%	1,930,554	23	4%	1,589,868	19	4%	8,994,962	108	21%	5,450,976	65	13%	20,441,160	245	47%	0	0	0%	43,240,850	519
2017	4,978,329	60	11%	1,930,554	23	4%	1,589,868	19	4%	8,994,962	108	21%	5,450,976	65	13%	20,441,160	245	47%	0	0	0%	43,385,849	521
2018	5,127,679	62	12%	1,930,554	23	4%	1,589,868	19	4%	8,994,962	108	21%	5,450,976	65	13%	20,441,160	245	47%	0	0	0%	43,535,199	522
2019	5,281,510	63	12%	1,930,554	23	4%	1,589,868	19	4%	8,994,962	108	21%	5,450,976	65	12%	20,441,160	245	47%	0	0	0%	43,689,030	524
2020	5,439,955	65	12%	1,930,554	23	4%	1,589,868	19	4%	8,994,962	108	21%	5,450,976	65	12%	20,441,160	245	47%	0	0	0%	43,847,475	526
2021	5,603,153	67	7%	1,930,554	23	2%	1,589,868	19	2%	8,994,962	108	11%	5,450,976	65	7%	30,661,740	368	39%	24,666,667	296	31%	78,897,921	947
2022	5,771,248	69	7%	1,930,554	23	2%	1,589,868	19	2%	8,994,962	108	11%	5,450,976	65	7%	30,661,740	368	39%	24,666,667	296	31%	79,066,015	949
2023	5,944,386	71	8%	1,930,554	23	2%	1,589,868	19	2%	8,994,962	108	11%	5,450,976	65	7%	30,661,740	368	39%	24,666,667	296	31%	79,239,153	951
2024	6,122,717	73	8%	1,930,554	23	2%	1,589,868	19	2%	8,994,962	108	11%	5,450,976	65	7%	30,661,740	368	39%	24,666,667	296	31%	79,417,484	953
2025	6,306,399	76	8%	1,930,554	23	2%	1,589,868	19	2%	8,994,962	108	11%	5,450,976	65	7%	30,661,740	368	39%	24,666,667	296	31%	79,601,166	955
2026	6,495,591	78	8%	1,930,554	23	2%	1,589,868	19	2%	8,994,962	108	11%	5,450,976	65	7%	30,661,740	368	38%	24,666,667	296	31%	79,790,358	957
2027	6,690,458	80	8%	1,930,554	23	2%	1,589,868	19	2%	8,994,962	108	11%	5,450,976	65	7%	30,661,740	368	38%	24,666,667	296	31%	79,985,225	960
2028	6,891,172	83	9%	1,930,554	23	2%	1,589,868	19	2%	8,994,962	108	11%	5,450,976	65	7%	30,661,740	368	38%	24,666,667	296	31%	80,185,939	962
2029	7,097,907	85	9%	1,930,554	23	2%	1,589,868	19	2%	8,994,962	108	11%	5,450,976	65	7%	30,661,740	368	38%	24,666,667	296	31%	80,392,674	965
2030	7,310,844	88	9%	1,930,554	23	2%	1,589,868	19	2%	8,994,962	108	11%	5,450,976	65	7%	30,661,740	368	38%	24,666,667	296	31%	80,605,612	967

Water and sanitation coverage data

Type of toilet/latrine facility	Urban (%)	Rural (%)	Total (%)	De Jure population (%)
Source IIPS 2007				
Improved, not shared	52.8	17.6	29.1	29.4
Flush/pour flush to piped sewer system	18.8	0.6	6.6	6.5
Flush/pour flush to septic tank	27.6	10.6	16.1	16.3
Flush/pour flush to pit latrine	4.7	4.1	4.3	4.4
Ventilated improved pit (VIP) latrine/biogas latrine	0.2	0.1	0.2	0.2
Pit latrine with slab	1.4	2.2	1.9	2
Twin pit, composting toilet	0	0	0	0
Not improved	46.7	82.2	70.6	70.3
Any facility shared with other households	24.2	5.3	11.5	10.2
Flush/pour flush not to sewer/septic tank/pit latrine	4.4	0.2	1.6	1.4
Pit latrine without slab/open pit	0.7	2.2	1.7	1.8
Dry toilet	0.5	0.6	0.5	0.7
No facility/open space/field	16.8	74	55.3	56.2
Other	0.4	0.1	0.2	0.2
Missing	0.2	0.1	0.1	0.1
Total	100	100	100	100
Number	35,579	73,462	109,041	522,027
NFSH 2006 in WHO/UNICEF (2008). Coverage estimates improved sanitation India.				
SANITATION	Urban (%)	Rural (%)		
Flush - to piped sewer system	28.3	0.8		
Flush - to septic tank	39.1	13.5		
Pit latrine - ventilated improved pit (VIP)	0.6	0.2		
Pit latrine - with slab	2.1	2.9		
Composting toilet	0.1	0		
Flush - to pit latrine	6.9	5.4		
Flush - don't know where	0.1	0		
Flush - to somewhere else	4	0.2		
Dry toilet	0.7	0.7		
Pit latrine - without slab/open pit	0.7	2.3		
No facility/uses bush/field	17	73.9		
OTHER	0.4	0.1		
TOTAL	100	100		
Estimated improved latrines/all latrines	0.64	0.73		
% Use of an improved sanitation facility	77	23		
% Sewerage connections	28	1		
Open defecation	17	74		

Rainfall and Evapotranspiration

year	Rain (mm)	ET (mm)
AVERAGE	828	2,554
1950	980	
1951	721	
1952	561	
1953	817	
1954	844	
1955	1113	
1956	779	
1957	801	
1958	915	
1959	778	
1960	693	
1961	821	
1962	1178	
1963	830	
1964	701	
1965	809	
1966	664	
1967	833	
1968	639	
1969	637	
1970	1147	
1971	665	
1972	516	
1973	878	
1974	675	2,675
1975	1384	2,523
1976	793	2,506
1977	544	2,652
1978	1117	2,569
1979	704	2,769
1980	592	2,664
1981	993	2,690
1982	767	2,666
1983	1320	2,714
1984	769	2,604
1985	373	2,758
1986	621	2,859
1987	963	2,689
1988	918	2,312
1989	1007	2,495
1990	920	2,142
1991	770	2,428
1992	765	2,394
1993	726	2,669
1994	820	2,375
1995	1004	2,457
1996	405	2,308
1997	765	2,485
1998	942	2,248
1999	618	2,458
2000	1475	2,269
2001	817	2,552
2002	705	2,732
2003	1134	2,957

Water Demand estimates for Hyderabad

Water demand estimations (present and future):							
Source	Per capita water demand (lpcd)	City Water Demand (MCM)				annual growth WD	
George 2008	140	520	for 2011. incl all uses				
HMWSSB 2005	148	442	2011				
		553	2021	incl all uses			1.0227
Saleth 1997		777	2011	all uses	% indus =	0.15	
		1013	2021	all uses	% indus =	0.15	1.0269
		659	2011	domestic (incl unaccounted			
		864	2021	domestic (incl unaccounted			
Kumar 2004		187	2011	135	MGD		
		243	2021	176	MGD		1.0269
Davis nd		730	2011	2,000	MLD	incl all uses	
		949	2021	2,600	MLD	incl all uses	1.0266
Kabeer (pers com 2004)	160	477	2011	incl all uses			
AP water vision		539	2011	1476	MLD		
		553	2021	1515	MLD		
CDM 2004		632	2011	1732	MLD		
		706	2021	1934	MLD		