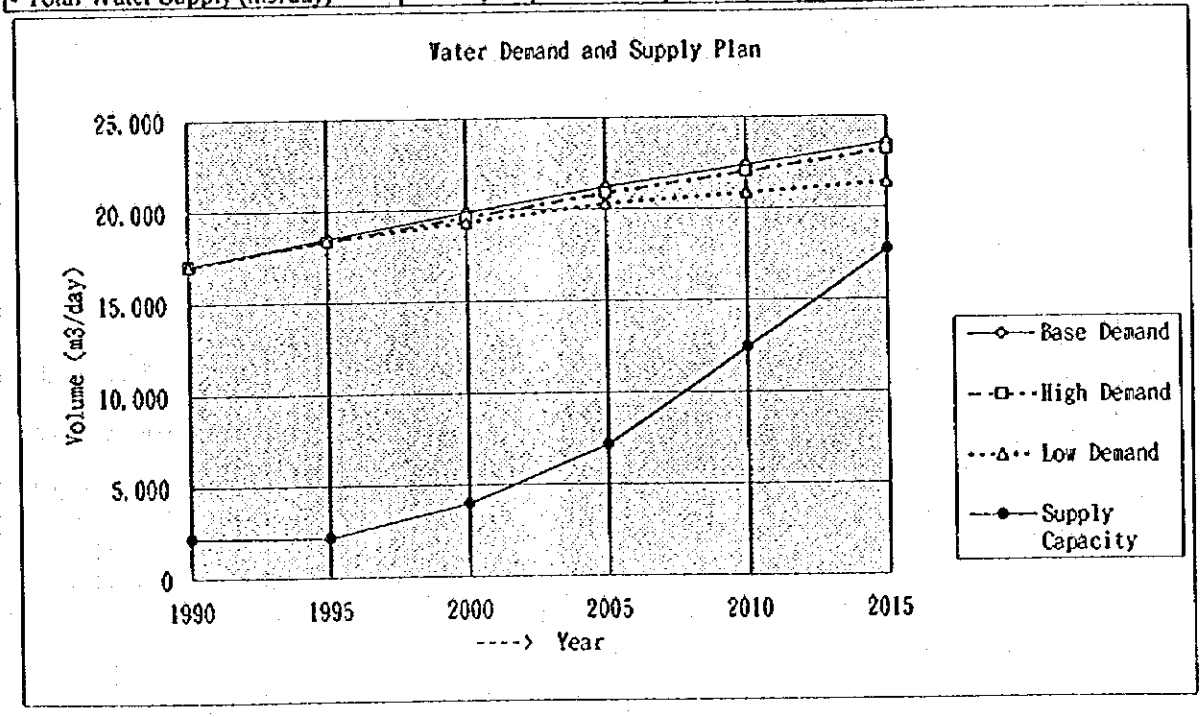
(7) Water Demand and Supply Plan for Rural Areas (Luapula Province)

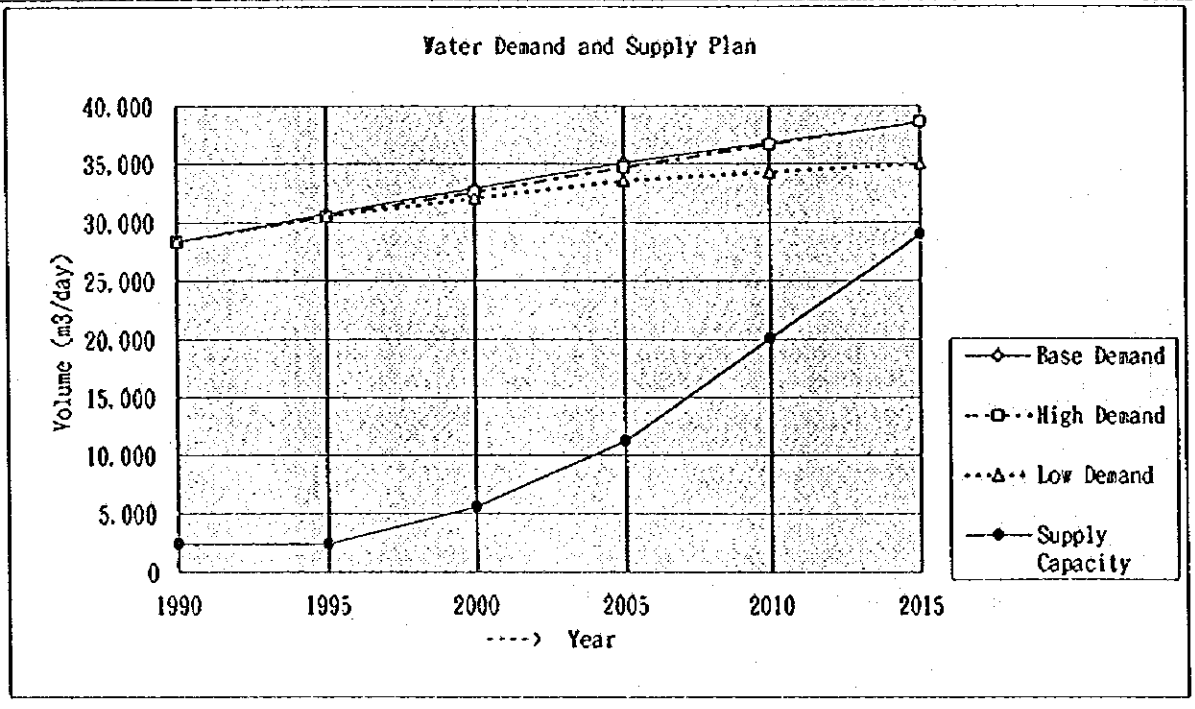
RURAL			PROVINCE		
			70	Luapula	
1990 CENSUS POPULATION AND FUTURE PROJECTION					
1990 Census Data		Projection Scenarios	1995	2005	2015
- Population	442,034	(1) Base Projection	480,000	551,000	612,000
- Household	125,933	(2) High Projection	476,000	542,000	602,000
- Family Size	3.5	(3) Low Projection	477,000	527,000	556,000

WATER DEMAND AND SUPPLY							
I t e m s		1990	1995	2000	2005	2010	2015
< Domestic Water >							
Consumption Rate (lit/cap./day)		35	35	35	35	35	35
Rural Water Demand (m3/day)	(Base)	15,471	16,800	18,043	19,285	20,353	21,420
	(High)	15,471	16,660	17,815	18,970	20,020	21,070
	(Low)	15,471	16,695	17,570	18,445	18,953	19,460
- Water Loss Rate (%)		10	10	10	10	10	10
Rural Net Water Demand (m3/day)	(Base)	17,018	18,480	19,847	21,214	22,388	23,562
	(High)	17,018	18,326	19,597	20,867	22,022	23,177
	(Low)	17,018	18,365	19,327	20,290	20,848	21,406
< Water Supply Program >							
- Existing Capacity (m3/day)		2,196	2,196	2,196	2,196	2,196	2,196
(1) Boreholes (243 wells)				1,823	1,823	1,823	1,823
(2) Boreholes (419 wells)					3,143	3,143	3,143
(3) Boreholes (703 wells)						5,273	5,273
(4) Boreholes (703 wells)							5,273
- Total Water Supply (m3/day)		2,196	2,196	4,019	7,162	12,435	17,708



(8) Water Demand and Supply Plan for Rural Areas (Northern Province)

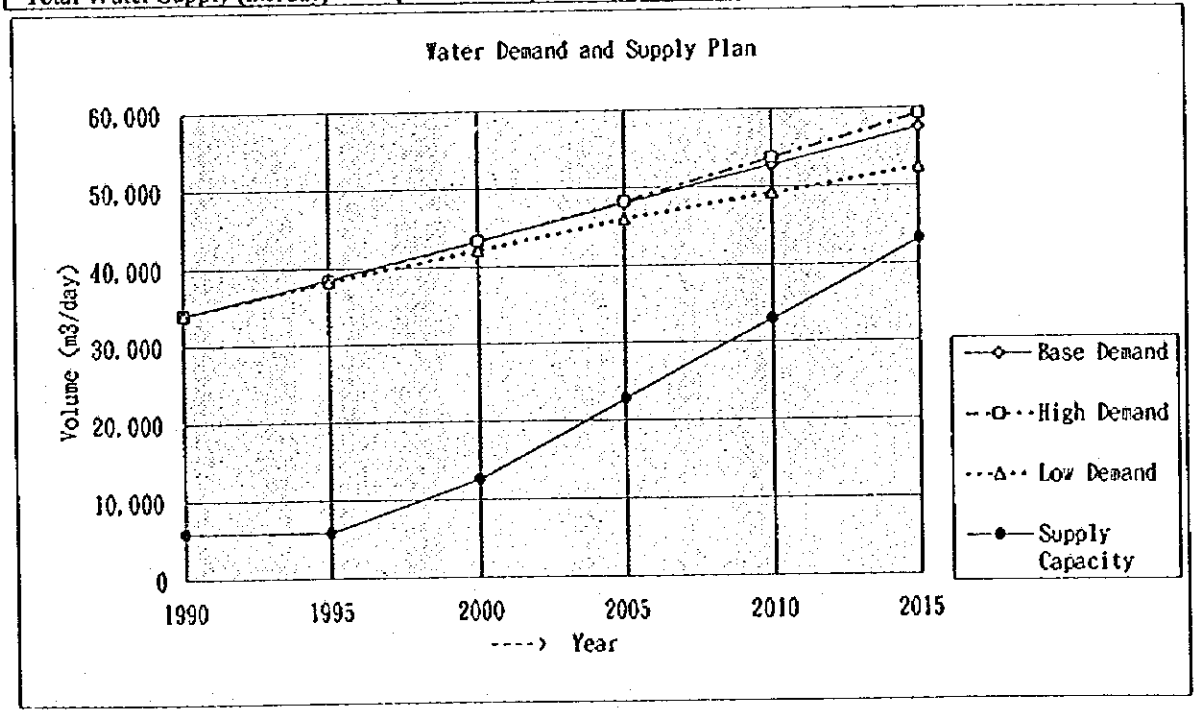
RURAL				PROVINCE		
				80	Northern	
1990 CENSUS POPULATION AND FUTURE PROJECTION						
1990 Census Data		Projection Scenarios		1995	2005	2015
- Population	736,876	(1) Base Projection		798,000	912,000	1,001,000
- Household	179,441	(2) High Projection		792,000	901,000	1,003,000
- Family Size	4.1	(3) Low Projection		792,000	872,000	909,000
WATER DEMAND AND SUPPLY						
Items		1990	1995	2000	2005	2010	2015
< Domestic Water >							
Consumption Rate (lit/cap./day)		35	35	35	35	35	35
Rural Water Demand (m3/day)	(Base)	25,791	27,930	29,925	31,920	33,478	35,035
	(High)	25,791	27,720	29,628	31,535	33,320	35,105
	(Low)	25,791	27,720	29,120	30,520	31,168	31,815
- Water Loss Rate (%)		10	10	10	10	10	10
Rural Net Water Demand (m3/day)	(Base)	28,370	30,723	32,918	35,112	36,825	38,539
	(High)	28,370	30,492	32,590	34,689	36,652	38,616
	(Low)	28,370	30,492	32,032	33,572	34,284	34,997
< Water Supply Program >							
- Existing Capacity (m3/day)		2,364	2,364	2,364	2,364	2,364	2,364
(1) Boreholes (428 wells)				3,210	3,210	3,210	3,210
(2) Boreholes (756 wells)					5,670	5,670	5,670
(3) Boreholes (1181 wells)						8,858	8,858
(4) Boreholes (1181 wells)							8,858
- Total Water Supply (m3/day)		2,364	2,364	5,574	11,244	20,102	28,960



(9) Water Demand and Supply Plan for Rural Areas (Eastern Province)

RURAL			PROVINCE		
			90	Eastern	
1990 CENSUS POPULATION AND FUTURE PROJECTION					
1990 Census Data		Projection Scenarios	1995	2005	2015
- Population	883,218	(1) Base Projection	1,001,000	1,247,000	1,494,000
- Household	186,307	(2) High Projection	997,000	1,252,000	1,539,000
- Family Size	4.7	(3) Low Projection	993,000	1,196,000	1,360,000

WATER DEMAND AND SUPPLY							
Items		1990	1995	2000	2005	2010	2015
< Domestic Water >							
Consumption Rate (lit/cap./day)		35	35	35	35	35	35
Rural Water Demand (m3/day)	(Base)	30,913	35,035	39,340	43,645	47,968	52,290
	(High)	30,913	34,895	39,358	43,820	48,843	53,865
	(Low)	30,913	34,755	38,308	41,860	44,730	47,600
- Water Loss Rate (%)		10	10	10	10	10	10
Rural Net Water Demand (m3/day)	(Base)	34,004	38,539	43,274	48,010	52,764	57,519
	(High)	34,004	38,385	43,293	48,202	53,727	59,252
	(Low)	34,004	38,231	42,138	46,046	49,203	52,360
< Water Supply Program >							
- Existing Capacity (m3/day)		5,880	5,880	5,880	5,880	5,880	5,880
(1) Boreholes (892 wells)				6,690	6,690	6,690	6,690
(2) Boreholes (1370 wells)					10,275	10,275	10,275
(3) Boreholes (1354 wells)						10,155	10,155
(4) Boreholes (1354 wells)							10,155
- Total Water Supply (m3/day)		5,880	5,880	12,570	22,845	33,000	43,155



THE STUDY ON NATIONAL WATER RESOURCES MASTER PLAN
IN THE REPUBLIC OF ZAMBIA

SUPPORTING REPORT (P)
WATER SUPPLY PLAN

APPENDIX - 2

COST ESTIMATE

Appendix 2 COST ESTIMATES

A2.1 Conditions of Cost Estimate

The construction costs of the proposed projects were estimated using construction prices at the end of January 1995. Foreign exchange rate was set at K610 to US$1.00 in accordance with the official exchange rate at the time. The estimated cost is preliminary to indicate the order of magnitude. The estimated construction costs consist of direct construction cost and engineering services cost. Land acquisition cost and physical contingency are not included in the estimated costs.

Table A2-1 Unit Cost of Water Resources Development

Items	Unit Cost	Remarks
Dam Construction	37.5 us$/m3	Unit price per volume of fill type dame
Drilling Wells		
- For Lusaka City	31,000 us$/well	D=300mm, L=100m, Power Pump: 40m3/hr
- For Urban Areas	25,400 us$/well	D=300mm, L=60m, Power Pump: 40m3/hr
- For Rural Area	9,300 us$/well	D=150mm, L=60m, Hund Pump : 7.5m3/day
Water Treatment (1)	300 us$/m3/day	For Groundwater
Water Treatment (2)		For Surface Water
- Capacity: 3,000 m3/day	900 us$/m3/day	
- Capacity: 5,000 m3/day	700 us$/m3/day	
- Capacity: 10,000 m3/day	500 us$/m3/day	
- Capacity: 20,000 m3/day	370 us$/m3/day	
- Capacity: 30,000 m3/day	340 us$/m3/day	
- Capacity: 40,000 m3/day	300 us$/m3/day	
- Capacity: 50,000 m3/day	290 us$/m3/day	
- Capacity: 60,000 m3/day	280 us$/m3/day	
- Capacity: 100,000 m3/day	250 us$/m3/day	
- Capacity: 150,000 m3/day	220 us$/m3/day	
Water Conveyance		
< Pipeline >		
- D = 300 mm	230 us$/m	
- D = 500 mm	300 us$/m	
- D = 700 mm	450 us$/m	
- D = 900 mm	600 us$/m	
- D = 1,200 mm	900 us$/m	
< Pump Station >	$C = 0.045x(PxQ)^{0.5}$	C : million us$/station P : Head (m) Q : Discharge (m3/s)
Distribution	200 us$/m3/day	
Engineering Service	10% of Dirct Constriction Cost	(Source Dev.elopment Cost + Treatment Cost + Conveyance Cost + Distribution Cost) x 10%

A2.2 Dam Construction Costs

Table A2-2 Dam Construction Cost

Projects	Developed Water (m3/day)	Dam Height (m)	Dam Volume (m3)	Construction Cost (Mil. us$)	Water Use and Cost Allocation		(Mil.us$)
(1) Chogwe Multi-purpose Dam	173,000 (2.002m3/s)	37.0	1,315,000	49.31	Water Supply:		29.36
					- Lusaka:	100,000	(28.48)
					m3/day		(0.88)
					- Chongwe:	3,000	29.95
					m3/day		
					Irrigation:	70,000	
					m3/day		
(2) Kafubu Multi-purpose Dam	430,000 (4.977m3/s)	27.0	795,000	29.81	Water Supply:		4.51
					- Ndola:	60,000	(4.16)
					m3/day		(0.35)
					- Luansha:	5,000	25.30
					m3/day		
					Irrigation:	365,000	
					m3/day		
(3) Mutundu Multi-purpose Dam	170,000 (1.968m3/s)	30.0	981,000	36.79	Water Supply :		7.57
					- Kitwe:	20,000	(4.33)
					m3/day		(2.16)
					- Kalulushi: 10,000 m3/day		(1.08)
					- Mufulira:	5,000	29.32
					m3/day		
					Irrigation: 135,000 m3/day		
(4) ?????? Dam	???,000 (?.???m3/s)	??.?	???,000	??.?	Irrigation: ???,000 m3/day		?.??

A2.3 Water Supply Projects

A2.3.1 Large Urban Areas

A2.3.1.1 Base Scenario - Agricultural Expansion

Table A2-3.1 Project Cost (Water Supply for Large Urban Areas)

Projects	Total (Mil. US$)	Source Dev. (Mil. US$)	Treatment (Mil. US$)	Conveyance (Mil. US$)	Distribution (Mil.US$)	Eng. Services (Mil.US$)
(1) Lusaka W/S from Northern Wells (20,000 m3/day)	15.75	1.55	6.00	2.77	4.00	1.43
(2) Lusaka W/S from Chongwe Dam (100,000 m3/day)	109.87	28.48	25.00	26.39	20.00	10.00
(3) Lusaka W/S from Kafue River	321.96	14.0	91.0	107.69	80.00	29.27
Phase-1: 100,000m3/day	87.40	4.00	25.0	30.45	20.00	7.95
Phase-2: 150,000m3/day	117.28	5.00	33.0	38.62	30.00	10.66
Phase-3: 150,000m3/day	117.28	5.00	33.0	38.62	30.00	10.66
(4) Ndola W/S from Kafubu Dam (60,000 m3/day)	53.50	4.16	16.80	15.68	12.0	4.86
(5) Luansha W/S from Kafubu Dam (5,000 m3/day)	8.80	0.35	3.50	3.15	1.00	0.80
(6) Kitwe W/S from Mutundu Dam (20,000 m3/day)	22.99	4.33	7.40	5.17	4.00	2.09
(7) Kalulushi W/S from Mutundu Dam (10,000 m3/day)	17.63	2.16	5.00	6.87	2.00	1.60
(8) Mufulira W/S from Mutundu Dam (5,000 m3/day)	9.63	1.08	3.50	3.17	1.00	0.88
(9) Kabwe W/Works Extention	43.46	-	18.85	9.26	11.40	3.95
Phase-1: 19,500 m3/day	16.82	-	7.22	4.17	3.90	1.53
Phase-2: 37,500 m3/day	26.64	-	11.63	5.09	7.50	2.42
(10) Livingstone W/W Extention	20.58	-	10.00	4.70	4.00	1.88
Phase-1: 10,000 m3/day	10.29	-	5.00	2.35	2.00	0.94
Phase-2: 10,000 m3/day	10.29	-	5.00	2.35	2.00	0.94
(11) Kasama W/ S from Lukupa River (14,000 m3/day)	12.65	-	6.02	2.68	2.80	1.15
(12) Chipata W/S from Production Wells (12,000 m3/day)	11.04	3.05	3.60	1.31	2.40	1.04

(1) Lusaka Water Supply from Luaka Northern Wells

<Project Outline>

Well Production Volume	20,000 m3/day
Well Number	50 Wells
Water Conveyance	Distance = 10 km, Head = 30 m Q = 0.694m 3/s, D: $[Q/(4.71 \sim 6.28)]^{0.5}$ D = 350 mm
Water Treatment	1 unit
Distribution	1 unit

<Cost for Source Development>

Cost = 31,000 us$/well x 50 wells = 1.55 mil.us$

<Cost for Water Treatment>

Cost = 300 us$/m x 20,000m3/day = 6.00 mil.us$

<Cost for Water Conveyance >

Cost(Pipe) = 250 us$/m x 10,000 m = 2.50 mil.us$

Cost(Pump) = $0.045 \times (50 \times 0.694)^{0.5}$ = 0.27 mil.us$

Total = = 2.77 mil.us$

<Cost for Water Distribution>

Cost = 200 us$/well x 20,000m3/day = 4.00 mil.us$

(2) Lusaka Water Supply from Chongwe Dam

<Project Outline>

Supply Volume	100,000 m3/day
Water Conveyance	Distance = 45 km, Head = 270 m Q = 3.472 m 3/s, D: $[Q/(4.71 \sim 6.28)]^{0.5}$ D = 800 mm
Water Treatment	1 unit
Distribution	1 unit

<Cost for Source Development>

Cost = = 28.48 mil.us$

<Cost for Water Treatment>

Cost = 250 us$/m x 100,000m3/day = 25.00 mil.us$

<Cost for Water Conveyance >

Cost(Pipe) = 525 us$/m x 45,000 m = 23.63 mil.us$

Cost(Pump) = $2 \times 0.045 \times (270 \times 3.472)^{0.5}$ = 2.76 mil.us$

Total = = 26.39 mil.us$

<Cost for Water Distribution>

Cost = 200 us$/well x 100,000m3/day = 20.00 mil.us$

(3) Lusaka Water Supply from Kafue River

<Project Outline>

Supply Volume	400,000m3/day (Phase-1:100,000m3/day (Phase-2 and Phase-3 : 150,000m3/day
Water Conveyance	Distance = 50 km, Head = 310 m (Phase-1) Q = 3.472 m 3/s, D: $[Q/(4.71 \sim 6.28)]^{0.5}$ D = 800 mm (Phase-2 and Phase-3) Q = 5.208 m 3/s, D: $[Q/(4.71 \sim 6.28)]^{0.5}$ D = 1000 mm
Water Treatment	3 units
Distribution	3 units

(Phase-1)

<Cost for Source Development>

Cost	=	(Intake Facilities)			=	4.00 mil.us$
<Cost for Water Treatment>						
Cost	=	250 us$/m	x	100,000m3/day	=	25.00 mil.us$
<Cost for Water Conveyance >						
Cost(Pipe)	=	550 us$/m	x	50,000 m	=	27.50 mil.us$
Cost(Pump)	=	$2 \times 0.045 \times (310 \times 3.472)^{0.5}$			=	2.95 mil.us$
Total	=				=	30.45 mil.us$
<Cost for Water Distribution>						
Cost	=	200 us$/well	x	100,000m3/day	=	20.00 mil.us$

(Phase-2 and Phase-3)

<Cost for Source Development>

Cost	=	(Intake Facilities)			=	5.00 mil.us$
<Cost for Water Treatment>						
Cost	=	220 us$/m	x	150,000m3/day	=	33.00 mil.us$
<Cost for Water Conveyance >						
Cost(Pipe)	=	700 us$/m	x	50,000 m	=	35.00 mil.us$
Cost(Pump)	=	$2 \times 0.045 \times (310 \times 5.208)^{0.5}$			=	3.62 mil.us$
Total	=				=	38.62 mil.us$
<Cost for Water Distribution>						
Cost	=	200 us$/well	x	150,000m3/day	=	30.00 mil.us$

(4) Ndola Water Supply from Kafubu Dam

<Project Outline>

Supply Volume	60,000 m3/day
Water Conveyance	Distance =40 km, Head = 110 m Q = 2.083 m 3/s, D: [Q/(4.71 ~ 6.28)]$^{0.5}$ D = 600 mm
Water Treatment	1 unit
Distribution	1 unit

<Cost for Source Development>

Cost = = 4.16 mil.us$

<Cost for Water Treatment>

Cost = 280 us$/m x 60,000m3/day = 16.80 mil.us$

<Cost for Water Conveyance >

Cost(Pipe) = 375 us$/m x 40,000 m = 15.00 mil.us$

Cost(Pump) = 0.045 x (110 x 2.083)$^{0.5}$ = 0.68 mil.us$

Total = = 15.68 mil.us$

<Cost for Water Distribution>

Cost = 200 us$/well x 60,000m3/day = 12.00 mil.us$

(5) Luanshya Water Supply from Kafubu Dam

<Project Outline>

Supply Volume	5,000 m3/day
Water Conveyance	Distance =15 km, Head = 60 m Q = 0.175 m 3/s, D: [Q/(4.71 ~ 6.28)]$^{0.5}$ D = 200 mm
Water Treatment	1 unit
Distribution	1 unit

<Cost for Source Development>

Cost = = 0.35 mil.us$

<Cost for Water Treatment>

Cost = 700 us$/m x 5,000m3/day = 3.50 mil.us$

<Cost for Water Conveyance >

Cost(Pipe) = 200 us$/m x 15,000 m = 3.00 mil.us$

Cost(Pump) = 0.045 x (60 x 0.175)$^{0.5}$ = 0.15 mil.us$

Total = = 3.15 mil.us$

<Cost for Water Distribution>

Cost = 200 us$/well x 5,000m3/day = 1.00 mil.us$

(6) Kitwe Water Supply from Mutundu Dam

<Project Outline>

Supply Volume	20,000 m3/day
Water Conveyance	Distance =20 km, Head = 20 m Q = 0.694 m 3/s, D: $[Q/(4.71 \sim 6.28)]^{0.5}$ D = 350 mm
Water Treatment	1 unit
Distribution	1 unit

<Cost for Source Development>

Cost = = 4.33 mil.us$

<Cost for Water Treatment>

Cost = 370 us$/m x 20,000m3/day = 7.40 mil.us$

<Cost for Water Conveyance >

Cost(Pipe) = 250 us$/m x 20,000 m = 5.00 mil.us$

Cost(Pump) = $0.045 \times (20 \times 0.694)^{0.5}$ = 0.17 mil.us$

Total = = 5.17 mil.us$

<Cost for Water Distribution>

Cost = 200 us$/well x 20,000m3/day = 4.00 mil.us$

(7) Kalulushi Water Supply from Mutundu Dam

<Project Outline>

Supply Volume	10,000 m3/day
Water Conveyance	Distance =30 km, Head = 100 m Q = 0.347 m 3/s, D: $[Q/(4.71 \sim 6.28)]^{0.5}$ D = 250 mm
Water Treatment	1 unit
Distribution	1 unit

<Cost for Source Development>

Cost = = 2.16 mil.us$

<Cost for Water Treatment>

Cost = 500 us$/m x 10,000m3/day = 5.00 mil.us$

<Cost for Water Conveyance >

Cost(Pipe) = 220 us$/m x 30,000 m = 6.60 mil.us$

Cost(Pump) = $0.045 \times (100 \times 0.347)^{0.5}$ = 0.27 mil.us$

Total = = 6.87 mil.us$

<Cost for Water Distribution>

Cost = 200 us$/well x 10,000m3/day = 2.00 mil.us$

(8) Mufulira Water Supply from Mutundu Dam

<Project Outline>

Supply Volume	5,000 m3/day
Water Conveyance	Distance =15 km, Head = 80 m Q = 0.174 m 3/s, D: [Q/(4.71 ~ 6.28)]$^{0.5}$ D = 200 mm
Water Treatment	1 unit
Distribution	1 unit

<Cost for Source Development>

Cost = = 1.08 mil.us$

<Cost for Water Treatment>

Cost = 700 us$/m x 5,000m3/day = 3.50 mil.us$

<Cost for Water Conveyance >

Cost(Pipe) = 200 us$/m x 15,000 m = 3.00 mil.us$

Cost(Pump) = 0.045 x (80 x 0.174) $^{0.5}$ = 0.17 mil.us$

Total = = 3.17 mil.us$

<Cost for Water Distribution>

Cost = 200 us$/well x 5,000m3/day = 1.00 mil.us$

(9) Kabwe Water Works Extension

<Project Outline>

Supply Volume	57,000m3/day (Phase-1: 19,500m3/day (Phase-2: 37,500m3/day
Water Conveyance	Distance = 15 km, Head = 130 m (Phase-1) Q = 0.677 m 3/s, D: [Q/(4.71 ~ 6.28)]$^{0.5}$ D = 350 mm (Phase-2) Q = 1.302 m 3/s, D: [Q/(4.71 ~ 6.28)]$^{0.5}$ D = 500 mm
Water Treatment	2 units
Distribution	2 units

(Phase-1)

<Cost for Source Development>

Cost = (Existing Facilities) = 0 mil.us$

<Cost for Water Treatment>

Cost = 370 us$/m x 19,500m3/day = 7.22 mil.us$

<Cost for Water Conveyance >

Cost(Pipe) = 250 us$/m x 15,000 m = 3.75 mil.us$

Cost(Pump) = 0.045 x (130 x 0.677) $^{0.5}$ = 0.42 mil.us$

Total = = 4.17 mil.us$

<Cost for Water Distribution>

Cost = 200 us$/well x 19,500m3/day = 3.90 mil.us$

(Phase-2)

<Cost for Source Development>

Cost	=	(Existing Facilities)			=	0 mil.us$
<Cost for Water Treatment>						
Cost	=	310 us$/m	x	37,500m3/day	=	11.63 mil.us$
<Cost for Water Conveyance >						
Cost(Pipe)	=	300 us$/m	x	15,000 m	=	4.50 mil.us$
Cost(Pump)	=	$0.045 \times (130 \times 1.302)^{0.5}$			=	0.59 mil.us$
Total	=				=	5.09 mil.us$
<Cost for Water Distribution>						
Cost	=	200 us$/well	x	37.500m3/day	=	7.50 mil.us$

(10) Livingstone Water Works Extension

<Project Outline>

Supply Volume	20,000m3/day (Phase-1: 10,000m3/day (Phase-2: 10,000m3/day
Water Conveyance	Distance = 10 km, Head = 30 m (Phase-1 and Phase-2) Q = 0.347 m 3/s, D: $\{Q/(4.71 \sim 6.28)\}^{0.5}$ D = 250 mm
Water Treatment	2 units
Distribution	2 units

(Phase-1 and Phase-2)

<Cost for Source Development>

Cost	=				=	0 mil.us$
<Cost for Water Treatment>						
Cost	=	500 us$/m	x	10,000m3/day	=	5.00 mil.us$
<Cost for Water Conveyance >						
Cost(Pipe)	=	220 us$/m	x	10,000 m	=	2.20 mil.us$
Cost(Pump)	=	$0.045 \times (30 \times 0.347)^{0.5}$			=	0.15 mil.us$
Total	=				=	2.35 mil.us$
<Cost for Water Distribution>						
Cost	=	200 us$/well	x	10,000m3/day	=	2.00 mil.us$

(11) Kasama Water Supply from Lukupa River

<Project Outline>

Supply Volume	14,000m3/day
Water Conveyance	Distance = 10 km, Head = 150 m Q = 0.486 m 3/s, D: [Q/(4.71 ~ 6.28)]$^{0.5}$ D = 300 mm
Water Treatment	1 unit
Distribution	1 unit

<Cost for Source Development>

Cost = = 0 mil.us$

<Cost for Water Treatment>

Cost = 430 us$/m x 14,000m3/day = 6.02 mil.us$

<Cost for Water Conveyance >

Cost(Pipe) = 230 us$/m x 10,000 m = 2.30 mil.us$

Cost(Pump) = 0.045 x (150 x 0.486) $^{0.5}$ = 0.38 mil.us$

Total = = 2.68 mil.us$

<Cost for Water Distribution>

Cost = 200 us$/well x 14,000m3/day = 2.80 mil.us$

(12) Chipata Water Supply from Wells

<Project Outline>

Production	12,000m3/day
Well Number	120 wells
Water Conveyance	Distance = 5 km, Head = 30 m Q = 0.417 m 3/s, D: [Q/(4.71 ~ 6.28)]$^{0.5}$ D = 300 mm
Water Treatment	1 unit
Distribution	1 unit

<Cost for Source Development>

Cost = 25,400 us$/well x 120 wells = 3.05 mil.us$

<Cost for Water Treatment>

Cost = 300 us$/m x 12,000m3/day = 3.60 mil.us$

<Cost for Water Conveyance >

Cost(Pipe) = 230 us$/m x 5,000 m = 1.15 mil.us$

Cost(Pump) = 0.045 x (30 x 0.417) $^{0.5}$ = 0.16 mil.us$

Total = = 1.31 mil.us$

<Cost for Water Distribution>

Cost = 200 us$/well x 12,000m3/day = 2.40 mil.us$

< Annual Cost Disbursement - Large Urban Areas >

Projects	Construction Cost (Mil.us$)	Annual Cost Disbursement (%)																			
		'96	97	98	99	00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15
1 Lusaka Wells	15.70		50	50																	
2 Chongwe Dam W/S	109.87			30	30	40															
3 Kafue Pipeline W/S	321.96																				
Phase-1	87.40								30	30	40										
Phase-2	117.28													30	30	40					
Phase-3	117.28																		30	30	40
4 Ndola (Kafubu Dam)	53.50													30	30	40					
5 Luansha (Kafubu Dam)	8.80													30	30	40					
6 Kitwe (Mutndu Dam)	22.99													30	30	40					
7 Kalulushi (Mutndu Dam)	17.63													30	30	40					
8 Mufulira (Mutndu Dam)	9.63													30	30	40					
9 Kabwe W/W Ext.	43.46																				
Phase-1	16.82			30	30	40															
Phase-2	26.64													30	30	40					
10 Livingstone W/W Ext.	20.58																				
Phase-1	10.29				50	50															
Phase-2	10.29									50	50										
11 Kasama W/W Ext	12.65									50	50										
12 Chipat Wells	11.04									50	50										

A2.3.1.2 Base Scenario - industrialisation

Table A2-3.2 Project Cost (Water Supply for Large Urban Areas)

Projects	Total (Mil. US$)	Source Dev. (Mil. US$)	Treatment (Mil. US$)	Conveyance (Mil. US$)	Distribution (Mil.US$)	Eng. Services (Mil.US$)
(1) Lusaka W/S from Northern Wells (20,000 m3/day)	15.75	1.55	6.00	2.77	4.00	1.43
(2) Lusaka W/S from Chongwe Dam (100,000 m3/day)	109.87	28.48	25.00	26.39	20.00	10.00
(3) Lusaka W/S from Kafue River	437.08	17.00	123.00	137.35	120.00	39.73
Phase-1: 150,000m3/day	117.28	5.00	33.00	38.62	30.00	10.66
Phase-2: 150,000m3/day	117.28	5.00	33.00	38.62	30.00	10.66
Phase-3: 300,000m3/day	202.52	7.00	57.00	60.11	60.00	18.41
(4) Ndola W/S from Kafubu Dam (110,000 m3/day)	86.85	7.63	26.40	22.92	22.00	7.90
(5) Luansha W/S from Kafubu Dam (20,000 m3/day)	18.51	1.39	7.40	4.04	4.00	1.68
(6) Kitwe W/S from Mutundu Dam (50,000 m3/day)	46.64	10.83	14.50	7.07	10.00	4.24
(7) Kalulushi W/S from Mutundu Dam (15,000 m3/day)	21.75	3.25	6.30	7.22	3.00	1.98
(8) Mufulira W/S from Mutundu Dam (15,000 m3/day)	17.92	3.25	6.30	3.74	3.00	1.63
(9) Kabwe W/Works Extention	55.62	-	24.29	10.28	16.00	5.05
Phase-1: 27,000 m3/day	21.26	-	9.45	4.48	5.40	1.93
Phase-2: 53,000 m3/day	34.36	-	14.84	5.80	10.60	3.12
(10) Livingstone W/W Extention	25.92	-	12.60	4.96	6.00	2.36
Phase-1: 15,000 m3/day	12.96	-	6.30	2.48	3.00	1.18
Phase-2: 15,000 m3/day	12.96	-	6.30	2.48	3.00	1.18
(11) Kasama W/ S from Lukupa River (35,000 m3/day)	23.99	-	11.20	3.61	7.00	2.18
(12) Chipata W/S from Production Wells (20,000 m3/day)	18.19	5.08	6.00	1.46	4.00	1.65

(1) Lusaka Water Supply from Luaka Northern Wells

<Project Outline>

Well Production Volume	20,000 m3/day
Well Number	50 Wells
Water Conveyance	Distance = 10 km, Head = 30 m Q = 0.694m 3/s, D: [Q/(4.71 ~ 6.28)]$^{0.5}$ D = 350 mm
Water Treatment	1 unit
Distribution	1 unit

<Cost for Source Development>

Cost = 31,000 us$/well x 50 wells = 1.55 mil.us$

<Cost for Water Treatment>

Cost = 300 us$/m x 20,000m3/day = 6.00 mil.us$

<Cost for Water Conveyance >

Cost(Pipe) = 250 us$/m x 10,000 m = 2.50 mil.us$

Cost(Pump) = 0.045 x (50 x 0.694)$^{0.5}$ = 0.27 mil.us$

Total = = 2.77 mil.us$

<Cost for Water Distribution>

Cost = 200 us$/well x 20,000m3/day = 4.00 mil.us$

(2) Lusaka Water Supply from Chongwe Dam

<Project Outline>

Supply Volume	100,000 m3/day
Water Conveyance	Distance = 45 km, Head = 270 m Q = 3.472 m 3/s, D: [Q/(4.71 ~ 6.28)]$^{0.5}$ D = 800 mm
Water Treatment	1 unit
Distribution	1 unit

<Cost for Source Development>

Cost = = 28.48 mil.us$

<Cost for Water Treatment>

Cost = 250 us$/m x 100,000m3/day = 25.00 mil.us$

<Cost for Water Conveyance >

Cost(Pipe) = 525 us$/m x 45,000 m = 23.63 mil.us$

Cost(Pump) = 2 x 0.045 x (270 x 3.472)$^{0.5}$ = 2.76 mil.us$

Total = = 26.39 mil.us$

<Cost for Water Distribution>

Cost = 200 us$/well x 100,000m3/day = 20.00 mil.us$

(3) Lusaka Water Supply from Kafue River

<Project Outline>

Supply Volume	590,000m3/day (Phase-1 and Phase-2 : 150,000m3/day (Phase-3 : 300,000m3/day
Water Conveyance	Distance = 50 km, Head = 310 m (Phase-1 and Phase-2) Q = 5.208 m 3/s, D: $[Q/(4.71 \sim 6.28)]^{0.5}$ D = 1000 mm (Phase-3) Q = 10.417 m 3/s, D: $[Q/(4.71 \sim 6.28)]^{0.5}$ D = 1400 mm
Water Treatment	3 units
Distribution	3 units

(Phase-1 and Phase-2)

<Cost for Source Development>

Cost	=	(Intake Facilities)			=	5.00 mil.us$

<Cost for Water Treatment>

Cost	=	220 us$/m	x	150,000m3/day	=	33.00 mil.us$

<Cost for Water Conveyance >

Cost(Pipe)	=	700 us$/m	x	50,000 m	=	35.00 mil.us$
Cost(Pump)	=	$2 \times 0.045 \times (310 \times 5.208)^{0.5}$			=	3.62 mil.us$
Total	=				=	38.62 mil.us$

<Cost for Water Distribution>

Cost	=	200 us$/well	x	150,000m3/day	=	30.00 mil.us$

(Phase-3)

<Cost for Source Development>

Cost	=	(Intake Facilities)			=	7.00 mil.us$

<Cost for Water Treatment>

Cost	=	190 us$/m	x	300,000m3/day	=	57.00 mil.us$

<Cost for Water Conveyance >

Cost(Pipe)	=	1100 us$/m	x	50,000 m	=	55.00 mil.us$
Cost(Pump)	=	$2 \times 0.045 \times (310 \times 10.417)^{0.5}$			=	5.11 mil.us$
Total	=				=	60.11 mil.us$

<Cost for Water Distribution>

Cost	=	200 us$/well	x	300,000m3/day	=	60.00 mil.us$

(4) Ndola Water Supply from Kafubu Dam

<Project Outline>

Supply Volume	110,000 m3/day
Water Conveyance	Distance =40 km, Head = 110 m Q = 3.819 m 3/s, D: [Q/(4.71 ~ 6.28)]$^{0.5}$ D = 800 mm
Water Treatment	1 unit
Distribution	1 unit

<Cost for Source Development>

Cost = = 7.63 mil.us$

<Cost for Water Treatment>

Cost = 240 us$/m x 110,000m3/day = 26.40 mil.us$

<Cost for Water Conveyance >

Cost(Pipe) = 550 us$/m x 40,000 m = 22.00 mil.us$

Cost(Pump) = 0.045 x (110 x 3.819)$^{0.5}$ = 0.92 mil.us$

Total = = 22.92 mil.us$

<Cost for Water Distribution>

Cost = 200 us$/well x 110,000m3/day = 22.00 mil.us$

(5) Luanshya Water Supply from Kafubu Dam

<Project Outline>

Supply Volume	20,000 m3/day
Water Conveyance	Distance =15 km, Head = 60 m Q = 0.694 m 3/s, D: [Q/(4.71 ~ 6.28)]$^{0.5}$ D = 350 mm
Water Treatment	1 unit
Distribution	1 unit

<Cost for Source Development>

Cost = = 1.39 mil.us$

<Cost for Water Treatment>

Cost = 370 us$/m x 20,000m3/day = 7.40 mil.us$

<Cost for Water Conveyance >

Cost(Pipe) = 250 us$/m x 15,000 m = 3.75 mil.us$

Cost(Pump) = 0.045 x (60 x 0.694)$^{0.5}$ = 0.29 mil.us$

Total = = 4.04 mil.us$

<Cost for Water Distribution>

Cost = 200 us$/well x 20,000m3/day = 4.00 mil.us$

(6) Kitwe Water Supply from Mutundu Dam

<Project Outline>

Supply Volume	50,000 m3/day
Water Conveyance	Distance =20 km, Head = 20 m Q = 1.736 m 3/s, D: $[Q/(4.71 \sim 6.28)]^{0.5}$ D = 550 mm
Water Treatment	1 unit
Distribution	1 unit

<Cost for Source Development>

Cost = = 10.83 mil.us$

<Cost for Water Treatment>

Cost = 290 us$/m x 50,000m3/day = 14.50 mil.us$

<Cost for Water Conveyance >

Cost(Pipe) = 340 us$/m x 20,000 m = 6.80 mil.us$

Cost(Pump) = $0.045 \times (20 \times 1.736)^{0.5}$ = 0.27 mil.us$

Total = = 7.07 mil.us$

<Cost for Water Distribution>

Cost = 200 us$/well x 50,000m3/day = 10.00 mil.us$

(7) Kalulushi Water Supply from Mutundu Dam

<Project Outline>

Supply Volume	15,000 m3/day
Water Conveyance	Distance =30 km, Head = 100 m Q = 0.521 m 3/s, D: $[Q/(4.71 \sim 6.28)]^{0.5}$ D = 300 mm
Water Treatment	1 unit
Distribution	1 unit

<Cost for Source Development>

Cost = = 3.25 mil.us$

<Cost for Water Treatment>

Cost = 420 us$/m x 15,000m3/day = 6.30 mil.us$

<Cost for Water Conveyance >

Cost(Pipe) = 230 us$/m x 30,000 m = 6.90 mil.us$

Cost(Pump) = $0.045 \times (100 \times 0.521)^{0.5}$ = 0.32 mil.us$

Total = = 7.22 mil.us$

<Cost for Water Distribution>

Cost = 200 us$/well x 15,000m3/day = 3.00 mil.us$

(8) Mufulira Water Supply from Mutundu Dam

<Project Outline>

Supply Volume	15,000 m3/day
Water Conveyance	Distance =15 km, Head = 80 m Q = 0.521 m 3/s, D: $[Q/(4.71 \sim 6.28)]^{0.5}$ D = 300 mm
Water Treatment	1 unit
Distribution	1 unit

<Cost for Source Development>

Cost = = 3.25 mil.us$

<Cost for Water Treatment>

Cost = 420 us$/m x 15,000m3/day = 6.30 mil.us$

<Cost for Water Conveyance >

Cost(Pipe) = 230 us$/m x 15,000 m = 3.45 mil.us$

Cost(Pump) = $0.045 \times (80 \times 0.521)^{0.5}$ = 0.29 mil.us$

Total = = 3.74 mil.us$

<Cost for Water Distribution>

Cost = 200 us$/well x 15,000m3/day = 3.00 mil.us$

(9) Kabwe Water Works Extension

<Project Outline>

Supply Volume	80,000m3/day (Phase-1: 27,000m3/day (Phase-2: 53,000m3/day
Water Conveyance	Distance = 15 km, Head = 130 m (Phase-1) Q = 0.938 m 3/s, D: $[Q/(4.71 \sim 6.28)]^{0.5}$ D = 400 mm (Phase-2) Q = 1.840 m 3/s, D: $[Q/(4.71 \sim 6.28)]^{0.5}$ D = 550 mm
Water Treatment	2 units
Distribution	2 units

(Phase-1)

<Cost for Source Development>

Cost = (Existing Facilities) = 0 mil.us$

<Cost for Water Treatment>

Cost = 350 us$/m x 27,000m3/day = 9.45 mil.us$

<Cost for Water Conveyance >

Cost(Pipe) = 265 us$/m x 15,000 m = 3.98 mil.us$

Cost(Pump) = $0.045 \times (130 \times 0.938)^{0.5}$ = 0.50 mil.us$

Total = = 4.48 mil.us$

<Cost for Water Distribution>

Cost = 200 us$/well x 27,000m3/day = 5.40 mil.us$

(Phase-2)

<Cost for Source Development>

Cost	=	(Existing Facilities)			=	0 mil.us$
<Cost for Water Treatment>						
Cost	=	280 us$/m	x	53,000m3/day	=	14.84 mil.us$
<Cost for Water Conveyance >						
Cost(Pipe)	=	340 us$/m	x	15,000 m	=	5.10 mil.us$
Cost(Pump)	=	$0.045 \times (130 \times 1.840)^{0.5}$			=	0.70 mil.us$
Total	=				=	5.80 mil.us$
<Cost for Water Distribution>						
Cost	=	200 us$/well	x	53,000m3/day	=	10.60 mil.us$

(10) Livingstone Water Works Extension

<Project Outline>

Supply Volume	30,000m3/day (Phase-1: 15,000m3/day (Phase-2: 15,000m3/day
Water Conveyance	Distance = 10 km, Head = 30 m (Phase-1 and Phase-2) Q = 0.521 m 3/s, D: $[Q/(4.71 \sim 6.28)]^{0.5}$ D = 300 mm
Water Treatment	2 units
Distribution	2 units

(Phase-1 and Phase-2)

<Cost for Source Development>

Cost	=				=	0 mil.us$
<Cost for Water Treatment>						
Cost	=	420 us$/m	x	15,000m3/day	=	6.30 mil.us$
<Cost for Water Conveyance >						
Cost(Pipe)	=	230 us$/m	x	10,000 m	=	2.30 mil.us$
Cost(Pump)	=	$0.045 \times (30 \times 0.521)^{0.5}$			=	0.18 mil.us$
Total	=				=	2.48 mil.us$
<Cost for Water Distribution>						
Cost	=	200 us$/well	x	15,000m3/day	=	3.00 mil.us$

(11) Kasama Water Supply from Lukupa River

<Project Outline>

Supply Volume	35,000m3/day
Water Conveyance	Distance = 10 km, Head = 150 m Q = 1.215 m 3/s, D: $[Q/(4.71 \sim 6.28)]^{0.5}$ D = 500 mm
Water Treatment	1 unit
Distribution	1 unit

<Cost for Source Development>

Cost = = 0 mil.us$

<Cost for Water Treatment>

Cost = 320 us$/m x 35,000m3/day = 11.20 mil.us$

<Cost for Water Conveyance >

Cost(Pipe) = 300 us$/m x 10,000 m = 3.00 mil.us$

Cost(Pump) = $0.045 \times (150 \times 1.215)^{0.5}$ = 0.61 mil.us$

Total = = 3.61 mil.us$

<Cost for Water Distribution>

Cost = 200 us$/well x 35,000m3/day = 7.00 mil.us$

(12) Chipata Water Supply from Wells

<Project Outline>

Production	20,000m3/day
Well Number	200 wells
Water Conveyance	Distance = 5 km, Head = 30 m Q = 0.694 m 3/s, D: $[Q/(4.71 \sim 6.28)]^{0.5}$ D = 350 mm
Water Treatment	1 unit
Distribution	1 unit

<Cost for Source Development>

Cost = 25,400 us$/well x 200 wells = 5.08 mil.us$

<Cost for Water Treatment>

Cost = 300 us$/m x 20,000m3/day = 6.00 mil.us$

<Cost for Water Conveyance >

Cost(Pipe) = 250 us$/m x 5,000 m = 1.25 mil.us$

Cost(Pump) = $0.045 \times (30 \times 0.694)^{0.5}$ = 0.21 mil.us$

Total = = 1.46 mil.us$

<Cost for Water Distribution>

Cost = 200 us$/well x 20,000m3/day = 4.00 mil.us$

A2.3.1.3 Conservative Scenario

Table A2-3.3 Project Cost (Water Supply for Large Urban Areas)

Projects	Total (Mil. US$)	Source Dev. (Mil. US$)	Treatment (Mil. US$)	Conveyance (Mil. US$)	Distribution (Mil.US$)	Eng. Services (Mil.US$)
(1) Lusaka W/S from Northern Wells (20,000 m3/day)	15.75	1.55	6.00	2.77	4.00	1.43
(2) Lusaka W/S from Chongwe Dam (100,000 m3/day)	109.87	28.48	25.00	26.39	20.00	10.00
(3) Lusaka W/S from Kafue River	262.20	12.00	75.00	91.35	60.00	23.85
Phase-1: 100,000m3/day	87.40	4.00	25.00	30.45	20.00	7.95
Phase-2: 100,000m3/day	87.40	4.00	25.00	30.45	20.00	7.95
Phase-3: 100,000m3/day	87.40	4.00	25.00	30.45	20.00	7.95
(4) Ndola W/S from Kafubu Dam (45,000 m3/day)	41.54	3.12	13.05	12.59	9.00	3.78
(5) Luansha W/S from Kafubu Dam (0 m3/day)	-	-	-	-	-	-
(6) Kitwe W/S from Mutundu Dam (0 m3/day)	-	-	-	-	-	-
(7) Kalulushi W/S from Mutundu Dam (6,000 m3/day)	13.74	1.30	3.78	6.21	1.20	1.25
(8) Mufulira W/S from Mutundu Dam (0 m3/day)	-	-	-	-	-	-
(9) Kabwe W/Works Extention	37.44	-	16.50	8.54	9.00	3.40
Phase-1: 15,000 m3/day	14.43	-	6.30	3.82	3.00	1.31
Phase-2: 30,000 m3/day	23.01	-	10.20	4.72	6.00	2.09
(10) Livingstone W/W Extention	18.50	-	8.96	4.66	3.20	1.68
Phase-1: 8,000 m3/day	9.25	-	4.48	2.33	1.60	0.84
Phase-2: 8,000 m3/day	9.25	-	4.48	2.33	1.60	0.84
(11) Kasama W/ S from Lukupa River (10,000 m3/day)	10.47	-	5.00	2.52	2.00	0.95
(12) Chipata W/S from Production Wells (9,000 m3/day)	8.83	2.29	2.70	1.24	1.80	0.80

(1) Lusaka Water Supply from Luaka Northern Wells

<Project Outline>

Well Production Volume	20,000 m3/day
Well Number	50 Wells
Water Conveyance	Distance = 10 km, Head = 30 m Q = 0.694m 3/s, D: $[Q/(4.71 \sim 6.28)]^{0.5}$ D = 350 mm
Water Treatment	1 unit
Distribution	1 unit

<Cost for Source Development>

Cost = 31,000 us$/well x 50 wells = 1.55 mil.us$

<Cost for Water Treatment>

Cost = 300 us$/m x 20,000m3/day = 6.00 mil.us$

<Cost for Water Conveyance >

Cost(Pipe) = 250 us$/m x 10,000 m = 2.50 mil.us$

Cost(Pump) = $0.045 \times (50 \times 0.694)^{0.5}$ = 0.27 mil.us$

Total = = 2.77 mil.us$

<Cost for Water Distribution>

Cost = 200 us$/well x 20,000m3/day = 4.00 mil.us$

(2) Lusaka Water Supply from Chongwe Dam

<Project Outline>

Supply Volume	100,000 m3/day
Water Conveyance	Distance = 45 km, Head = 270 m Q = 3.472 m 3/s, D: $[Q/(4.71 \sim 6.28)]^{0.5}$ D = 800 mm
Water Treatment	1 unit
Distribution	1 unit

<Cost for Source Development>

Cost = = 28.48 mil.us$

<Cost for Water Treatment>

Cost = 250 us$/m x 100,000m3/day = 25.00 mil.us$

<Cost for Water Conveyance >

Cost(Pipe) = 525 us$/m x 45,000 m = 23.63 mil.us$

Cost(Pump) = $2 \times 0.045 \times (270 \times 3.472)^{0.5}$ = 2.76 mil.us$

Total = = 26.39 mil.us$

<Cost for Water Distribution>

Cost = 200 us$/well x 100,000m3/day = 20.00 mil.us$

(3) Lusaka Water Supply from Kafue River

<Project Outline>

Supply Volume	300,000m3/day (Phase-1, Phase-2 and Phase-3: 100,000m3/day
Water Conveyance	Distance = 50 km, Head = 310 m (Phase-1, Phase-2 and Phase-3) Q = 3.472 m 3/s, D: [Q/(4.71 ~ 6.28)]$^{0.5}$ D = 800 mm
Water Treatment	3 units
Distribution	3 units

(Phase-1,Phase-2 and Phase-3)

<Cost for Source Development>

Cost = (Intake Facilities) = 4.00 mil.us$

<Cost for Water Treatment>

Cost = 250 us$/m x 100,000m3/day = 25.00 mil.us$

<Cost for Water Conveyance >

Cost(Pipe) = 550 us$/m x 50,000 m = 27.50 mil.us$

Cost(Pump) = $2 \times 0.045 \times (310 \times 3.472)^{0.5}$ = 2.95 mil.us$

Total = = 30.45 mil.us$

<Cost for Water Distribution>

Cost = 200 us$/well x 100,000m3/day = 20.00 mil.us$

(4) Ndola Water Supply from Kafubu Dam

<Project Outline>

Supply Volume	45,000 m3/day
Water Conveyance	Distance =40 km, Head = 110 m Q = 1.563 m 3/s, D: [Q/(4.71 ~ 6.28)]$^{0.5}$ D = 500 mm
Water Treatment	1 unit
Distribution	1 unit

<Cost for Source Development>

Cost = = 3.12 mil.us$

<Cost for Water Treatment>

Cost = 290 us$/m x 45,000m3/day = 13.05 mil.us$

<Cost for Water Conveyance >

Cost(Pipe) = 300 us$/m x 40,000 m = 12.00 mil.us$

Cost(Pump) = $0.045 \times (110 \times 1.563)^{0.5}$ = 0.59 mil.us$

Total = = 12.59 mil.us$

<Cost for Water Distribution>

Cost = 200 us$/well x 45,000m3/day = 9.00 mil.us$

(5) Luanshya Water Supply from Kafubu Dam

<Project Outline>

Supply Volume	0 m3/day
Water Conveyance	
Water Treatment	
Distribution	

(6) Kitwe Water Supply from Mutundu Dam

<Project Outline>

Supply Volume	0 m3/day
Water Conveyance	
Water Treatment	
Distribution	

(7) Kalulushi Water Supply from Mutundu Dam

<Project Outline>

Supply Volume	6,000 m3/day
Water Conveyance	Distance =30 km, Head = 100 m Q = 0.208 m 3/s, D: $[Q/(4.71 \sim 6.28)]^{0.5}$ D = 200 mm
Water Treatment	1 unit
Distribution	1 unit

<Cost for Source Development>

Cost = = 1.30 mil.us$

<Cost for Water Treatment>

Cost = 630 us$/m x 6,000m3/day = 3.78 mil.us$

<Cost for Water Conveyance >

Cost(Pipe) = 200 us$/m x 30,000 m = 6.00 mil.us$

Cost(Pump) = $0.045 \times (100 \times 0.208)^{0.5}$ = 0.21 mil.us$

Total = = 6.21 mil.us$

<Cost for Water Distribution>

Cost = 200 us$/well x 6,000m3/day = 1.20 mil.us$

(8) Mufulira Water Supply from Mutundu Dam

<Project Outline>

Supply Volume	0 m3/day
Water Conveyance	
Water Treatment	
Distribution	

(9) Kabwe Water Works Extension

<Project Outline>

Supply Volume	45,000m3/day (Phase-1: 15,000m3/day (Phase-2: 30,000m3/day
Water Conveyance	Distance = 15 km, Head = 130 m (Phase-1) Q = 0.521 m 3/s, D: $[Q/(4.71 \sim 6.28)]^{0.5}$ D = 300 mm (Phase-2) Q = 1.042 m 3/s, D: $[Q/(4.71 \sim 6.28)]^{0.5}$ D = 450 mm
Water Treatment	2 units
Distribution	2 units

(Phase-1)

<Cost for Source Development>						
Cost	= (Existing Facilities)			=	0	mil.us$
<Cost for Water Treatment>						
Cost	= 420 us$/m	x	15,000m3/day	=	6.30	mil.us$
<Cost for Water Conveyance >						
Cost(Pipe)	= 230 us$/m	x	15,000 m	=	3.45	mil.us$
Cost(Pump)	= $0.045 \times (130 \times 0.521)^{0.5}$			=	0.37	mil.us$
Total	=			=	3.82	mil.us$
<Cost for Water Distribution>						
Cost	= 200 us$/well	x	15,000m3/day	=	3.00	mil.us$

(Phase-2)

<Cost for Source Development>						
Cost	= (Existing Facilities)			=	0	mil.us$
<Cost for Water Treatment>						
Cost	= 340 us$/m	x	30,000m3/day	=	10.20	mil.us$
<Cost for Water Conveyance >						
Cost(Pipe)	= 280 us$/m	x	15,000 m	=	4.20	mil.us$
Cost(Pump)	= $0.045 \times (130 \times 1.042)^{0.5}$			=	0.52	mil.us$
Total	=			=	4.72	mil.us$
<Cost for Water Distribution>						
Cost	= 200 us$/well	x	30,000m3/day	=	6.00	mil.us$

(10) Livingstone Water Works Extension

<Project Outline>

Supply Volume	16,000m3/day (Phase-1: 8,000m3/day (Phase-2: 8,000m3/day
Water Conveyance	Distance = 10 km, Head = 30 m (Phase-1 and Phase-2) Q = 0.278 m 3/s, D: $[Q/(4.71 \sim 6.28)]^{0.5}$ D = 250 mm
Water Treatment	2 units
Distribution	2 units

(Phase-1 and Phase-2)

<Cost for Source Development>

Cost	=				=	0 mil.us$

<Cost for Water Treatment>

Cost	=	560 us$/m	x	8,000m3/day	=	4.48 mil.us$

<Cost for Water Conveyance >

Cost(Pipe)	=	220 us$/m	x	10,000 m	=	2.20 mil.us$
Cost(Pump)	=	$0.045 \times (30 \times 0.278)^{0.5}$			=	0.13 mil.us$
Total	=				=	2.33 mil.us$

<Cost for Water Distribution>

Cost	=	200 us$/well	x	8,000m3/day	=	1.60 mil.us$

(11) Kasama Water Supply from Lukupa River

<Project Outline>

Supply Volume	10,000m3/day
Water Conveyance	Distance = 10 km, Head = 150 m Q = 0.347 m 3/s, D: $[Q/(4.71 \sim 6.28)]^{0.5}$ D = 250 mm
Water Treatment	1 unit
Distribution	1 unit

<Cost for Source Development>

Cost	=				=	0 mil.us$

<Cost for Water Treatment>

Cost	=	500 us$/m	x	10,000m3/day	=	5.00 mil.us$

<Cost for Water Conveyance >

Cost(Pipe)	=	220 us$/m	x	10,000 m	=	2.20 mil.us$
Cost(Pump)	=	$0.045 \times (150 \times 0.347)^{0.5}$			=	0.32 mil.us$
Total	=				=	2.52 mil.us$

<Cost for Water Distribution>

Cost	=	200 us$/well	x	10,000m3/day	=	2.00 mil.us$

(12) Chipata Water Supply from Wells

<Project Outline>

Production	9,000m3/day
Well Number	90 wells
Water Conveyance	Distance = 5 km, Head = 30 m Q = 0.313 m 3/s, D: $[Q/(4.71 \sim 6.28)]^{0.5}$ D = 250 mm
Water Treatment	1 unit
Distribution	1 unit

<Cost for Source Development>

Cost = 25,400 us$/well x 90 wells = 2.29 mil.us$

<Cost for Water Treatment>

Cost = 300 us$/m x 9,000m3/day = 2.70 mil.us$

<Cost for Water Conveyance >

Cost(Pipe) = 220 us$/m x 5,000 m = 1.10 mil.us$

Cost(Pump) = $0.045 \times (30 \times 0.313)^{0.5}$ = 0.14 mil.us$

Total = = 1.24 mil.us$

<Cost for Water Distribution>

Cost = 200 us$/well x 9,000m3/day = 1.80 mil.us$

A2.3.2 Small Urban Areas

Project Cost (W/S for Small Urban Areas)on Basic Scenario-Aguricultural Expansion

	Total (Mil. US$)	Source Dev. (Mil. US$)	Treatment (Mil. US$)	Conveyance (Mil. US$)	Distribution (Mil.US$)	Eng. Services (Mil.US$)
(1) Lusaka Province						
- Surface Water Projects	27.01	0.88	14.49	4.49	4.72	2.46
- Groundwater Projects	0.66	0.12	0.29	-	0.19	0.06
Chongwe	3.51	0.88	1.35	0.66	0.30	0.32
Kafue	16.64	-	9.45	2.08	3.60	1.51
Chilanga	5.81	-	3.24	1.32	0.72	0.53
Rufunsa	0.66	0.12	0.29	-	0.19	0.06
Luangwa	1.08	-	0.45	0.43	0.10	0.10
(2) Copperbelt Province						
- Surface Water Projects	0.00					
- Groundwater Projects	3.66	0.40	1.75	-	1.17	0.34
Masaiti	0.30	0.14	0.08	-	0.05	0.03
Mpongwe	1.83	0.14	0.91	-	0.61	0.17
Konkola	0.00					
Chambishi	1.53	0.12	0.76	-	0.51	0.14
(3) Central Province						
- Surface Water Projects	0.00					
- Groundwater Projects	13.32	5.31	4.08	-	2.71	1.22
Chibombo	1.21	0.09	0.61	-	0.40	0.11
Chisamba	0.30	0.02	0.15	-	0.10	0.03
Kapri Mposhi	2.66	1.27	0.69	-	0.46	0.24
Mumbwa	4.03	2.08	0.95	-	0.63	0.37
Namupundwe	1.00	0.28	0.38	-	0.25	0.09
Mukushi	1.93	0.53	0.73	-	0.49	0.18
Serenje	2.19	1.04	0.57	-	0.38	0.20
(4) Northwestern Pro						
- Surface Water Projects	14.13	-	7.72	2.80	2.32	1.29
- Groundwater Projects	4.11	2.13	0.97	-	0.64	0.37
Solwezi	7.60	-	4.48	0.83	1.60	0.69
Mwinilunga	1.94	-	0.90	0.66	0.20	0.18
Zambezi	2.31	-	1.35	0.45	0.30	0.21
Chavuma	0.95	-	0.36	0.42	0.08	0.09
Kabompo	1.33	-	0.63	0.44	0.14	0.12
Mfumbwe	2.68	1.39	0.63	-	0.42	0.24
Kasempa	1.43	0.74	0.34	-	0.22	0.13
(5) Western Province						
- Surface Water Projects	8.39	-	5.13	1.35	1.14	0.77
- Groundwar Projects	10.16	0.82	5.05	-	3.35	0.94
Mongu	3.96	0.32	1.97	-	1.31	0.36
Limulunga	1.12	0.09	0.56	-	0.37	0.10
Namushakande	0.57	0.05	0.28	-	0.19	0.05
Lukulu	0.85	0.07	0.42	-	0.28	0.08
Kalabo	3.04	-	1.89	0.45	0.42	0.28
Sikongo	0.28	0.02	0.14	-	0.09	0.03
Kaoma	2.54	0.21	1.26	-	0.84	0.23
Senanga	3.17	-	1.98	0.46	0.44	0.29
Shangombo	0.28	0.02	0.14	-	0.09	0.03
Sesheke	2.18	-	1.26	0.44	0.28	0.20
Mulobezi	0.28	0.02	0.14	-	0.09	0.03
Katima-Mulilo	0.28	0.02	0.14	-	0.09	0.03

Projects	Total (Mil. US$)	Source Dev. (Mil. US$)	Treatment (Mil. US$)	Conveyance (Mil. US$)	Distribution (Mil.US$)	Eng. Services (Mil.US$)
(6) Southern Province						
- Surface Water Projects	3.14	-	1.26	1.31	0.28	0.29
- Groundwater Projects	22.09	7.28	7.68	-	5.12	2.01
Namwala	0.85	0.07	0.42	-	0.28	0.08
Itezhi-Tezhi	2.01	1.04	0.47	-	0.32	0.18
Mazabuka	3.96	0.32	1.97	-	1.31	0.36
Magoye	0.63	0.32	0.15	-	0.10	0.06
Nakambala	1.12	0.09	0.56	-	0.37	0.10
Nega-nega	0.57	0.05	0.28	-	0.19	0.05
Kafue-gorge	0.58	0.28	0.15	-	0.10	0.05
Chikankata	1.12	0.58	0.26	-	0.18	0.10
Monze	1.67	0.46	0.64	-	0.42	0.15
Chisekesi	0.44	0.21	0.11	-	0.08	0.04
Choma	2.92	1.39	0.76	-	0.50	0.27
Batoka	0.44	0.21	0.11	-	0.08	0.04
Pemba	0.48	0.23	0.13	-	0.08	0.04
Mbabala	0.33	0.09	0.13	-	0.08	0.03
Kalomo	2.10	0.58	0.80	-	0.53	0.19
Zimba	0.30	0.14	0.08	-	0.05	0.03
Siavonga	0.00					
Chirundu	1.10	-	0.45	0.45	0.10	0.10
Gwembe	0.63	0.30	0.16	-	0.11	0.06
Sinazongwe	2.04	-	0.81	0.86	0.18	0.19
Maamba	1.94	0.92	0.50	-	0.34	0.18
(7) Luapula Province						
- Surface Water Projects	9.19	-	5.54	1.42	1.40	0.83
- Groundwater Projects	6.61	1.82	2.51	-	1.68	0.60
Mansa	6.03	1.66	2.29	-	1.53	0.55
Nchelenge	5.17	-	3.29	0.51	0.90	0.47
Chiengi	1.35	-	0.63	0.46	0.14	0.12
Kawambwa	0.00					
Mwansabombwe	0.58	0.16	0.22	-	0.15	0.05
Mwense	0.00					
Samfya	2.67	-	1.62	0.45	0.36	0.24
(8) Northern Province						
- Surface Water Projects	0.00					
- Groundwater Projects	16.25	5.11	5.80	-	3.86	1.48
Kaputa	1.40	0.72	0.33	-	0.22	0.13
Mbala	1.87	0.97	0.44	-	0.29	0.17
Mpulungu	0.00					
Mporokoso	1.27	0.35	0.48	-	0.32	0.12
Luwingu	0.58	0.16	0.22	-	0.15	0.05
Chilubi	0.23	0.12	0.05	-	0.04	0.02
Isoka	2.18	0.60	0.83	-	0.55	0.20
Nakonde	1.00	0.28	0.38	-	0.25	0.09
Chinsali	1.12	0.09	0.56	-	0.37	0.10
Mpika	6.60	1.82	2.51	-	1.67	0.60

Projects	Total (Mil. US$)	Source Dev. (Mil. US$)	Treatment (Mil. US$)	Conveyance (Mil. US$)	Distribution (Mil.US$)	Eng. Services (Mil.US$)
(9) Eastern Province						
- Surface Water Projects	0.00					
- Groundwater Projects	14.28	6.60	3.83	-	2.55	1.30
Chama	2.04	0.97	0.53	-	0.35	0.19
Lundazi	2.43	1.16	0.63	-	0.42	0.22
Chadiza	0.66	0.18	0.25	-	0.17	0.06
Katete	3.64	1.73	0.95	-	0.63	0.33
Petauke	4.37	2.08	1.13	-	0.76	0.40
Nyimba	0.81	0.39	0.21	-	0.14	0.07
Kacholola	0.33	0.09	0.13	-	0.08	0.03

Annual Cost Disbursement (Small Urban Areas)

Provinces and Projects	Construction Cost (Mil.us$)	Annual Cost Disbursement (%)																		
		'96	97	98	99	00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15
(1) Lusaka Province																					
- Surface Water Projects	27.04																				
- Groundwater Projects	0.66																				
Chongwe	3.51				50	50															
Kafue	16.64								16	16	21			14	14	19					
Chilanga	5.81									16	17				16	17				17	17
Rufunsa	0.66					60					20					20					
Luangwa	1.08									50	50										
(2) Copperbelt Province																					
- Surface Water Projects	0.00																				
- Groundwater Projects	3.66																				
Masaiti	0.30										50					50					
Mpongwe	1.83		17	17	16	16					17					17					
Konkola	0.00																				
Chambishi	1.53					60					20					20					
(3) Central Province																					
- Surface Water Projects	0.00																				
- Groundwater Projects	13.32																				
Chibombo	1.21					75										25					
Chisamba	0.30										100										
Kapri Mposhi	2.66	8	8	7	7	7	6	6	5	5	5	4	4	4	3	3	4	4	4	3	3
Mumbwa	4.03	10	10	10	10	10	4	4	3	3	3	4	4	3	3	3	4	3	3	3	3
Namupundwe	1.00	17	9	8	8	8					25					25					
Mukushi	1.93	15	15	15	15	14					13					13					
Serenje	2.19	7	7	7	7	6	5	5	4	4	4	5	5	4	4	4	5	5	4	4	4
(4) Northwestern Pro.																					
- Surface Water Projects	14.13																				
- Groundwater Projects	4.31																				
Solwezi	7.60				50	50															
Mwinilunga	1.94									50	50										
Zambezi	2.31									50	50										
Chavuma	0.95				50	50															
Kabompo	1.33														50	50					
Mfumbwe	2.68		19	19	19	18	2	2	2	2	1	2	2	2	1	1	2	2	2	1	1
Kasempa	1.43		14	14	14	13	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3
(5) Western Province																					
- Surface Water Projects	8.39																				
- Groundwater Projects	10.16																				
Mongu	3.96	14	14	14	7	7					22					22					
Limulunga	1.12					50					25					25					
Namushakande	0.57					50					50										
Lukulu	0.85					66										34					
Kalabo	3.04				50	50															
Sikongo	0.28					100															
Kaoma	2.54	12	11	11	11	11					22					22					
Senanga	3.17									50	50										
Shangombo	0.28					100															
Sesheke	2.18				50	50															
Mulobezi	0.28					100															
Katima-Mulilo	0.28										100										

Provinces and Projects	Construction Cost (Mil.us$)	Annual Cost Disbursement (%)																			
		'96	97	98	99	00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15
(6) Southern Province																					
- Surface Water Projects	3.14																				
- Groundwater Projects	22.09																				
Namwala	0.85					67										33					
Itezhitezhi	2.01	7	7	7	7	6	5	5	4	4	4	5	5	4	4	4	5	5	4	4	4
Mazabuka	3.96	14	14	14	8	8					14					14					14
Magoye	0.63	14	14	14	8	8					21					21					
Nakambala	1.12					50					25					25					
Nega-nega	0.57					50										50					
Kafue-gorge	0.58	17	17	16	8	8					17					17					
Chikankata	1.12	8	8	8	8	8	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4
Monze	1.67	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5
Chisekesi	0.44	12	11	11	11	11					22					22					
Choma	2.92						7	7	7	7	6	7	7	7	6	6	7	7	7	6	6
Batoka	0.44	12	11	11	11	11					22					22					
Pemba	0.48	20	10	10	10	10					20					20					
Mbabala	0.33					50					25					25					
Kalomo	2.10	8	8	8	8	8	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4
Zimba	0.30										50					50					
Siavonga	0.00																				
Chirundu	1.10				50	50															
Gwembe	0.63	16	16	15	15	8					15					15					
Sinazongwe	2.04				50	50															
Maamba	1.94	10	10	10	8	7	5	5	5	5	5	5	3	3	2	2	5	3	3	2	2
(7) Luapula Province																					
- Surface Water Projects	9.16																				
- Groundwater Projects	6.61																				
Mansa	6.03		14	14	14	14	4	4	3	3	2	3	3	3	3	2	3	3	3	3	2
Nchelenge	5.17				50	50															
Chiengi	1.35				50	50															
Kawambwa	0.00																				
Mwansabombwe	0.58		18	18	18	18					14					14					
Mwense	0.00																				
Samfya	2.67									50	50										
(8) Northern Province																					
- Surface Water Projects	0.00																				
- Groundwater Projects	16.25																				
Kaputa	1.40		16	16	16	16	6	6	6	4	4					10					
Mbala	1.87		12	12	12	12	7	7	5	5	4	3	3	2	2	2	3	3	2	2	2
Mpulungu	0.00																				
Mporokoso	1.27		20	20	20	14					13					13					
Luwingu	0.58		30	14	14	14					14					14					
Chilubi	0.23		40	20	20	20															
Isoka	2.18		20	19	19	19					15					8					
Nakonde	1.00		25	17	17	17					8					8					8
Chinsali	1.12					75										25					
Mpika	6.60		16	16	15	15	4	4	4	4	4	3	3	1	1	1	3	3	1	1	1

Provinces and Projects	Construction Cost (Mil.us$)	Annual Cost Disbursement (%)																		
		'96	97	98	99	00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15
(9) Eastern Province																					
- Surface Water Projects	0.00																				
- Groundwater Projects	14.28																				
Chama	2.04		17	14	14	14	5	5	3	2	2	3	3	2	2	2	3	3	2	2	2
Lundazi	2.43		14	12	12	12	6	6	6	6	6	2	2	2	2	2	2	2	2	2	2
Chadiza	0.66		13	13	12	12					25					25					
Katete	3.64		19	19	18	17	3	3	3	2	2	2	2	1	1	1	2	2	1	1	1
Petauke	4.37		15	15	13	13	5	5	4	4	4	3	2	2	2	2	3	2	2	2	2
Nyimba	0.81		23	18	18	17					12					12					
Kacholola	0.33					50					25					25					

Project Cost (W/S for Small Urban Areas) on Base Scenario-Industrialisation

	Total (Mil. US$)	Source Dev. (Mil. US$)	Treatment (Mil. US$)	Conveyance (Mil. US$)	Distribution (Mil.US$)	Eng. Services (Mil.US$)
(1) Lusaka Province						
- Surface Water Projects	54.81	0.88	30.47	6.01	12.46	4.99
- Groundwater Projects	1.19	0.21	0.52	-	0.35	0.11
Chongwe	5.91	0.88	3.00	0.69	0.80	0.54
Kafue	36.85	-	20.00	3.50	10.00	3.35
Chilanga	9.98	-	6.30	1.37	1.40	0.91
Rufunsa	1.19	0.21	0.52	-	0.35	0.11
Luangwa	2.07	-	1.17	0.45	0.26	0.19
(2) Copperbelt Province						
- Surface Water Projects	0.00					
- Groundwater Projects	10.07	1.39	4.65	-	3.11	0.92
Masaiti	1.55	0.74	0.40	-	0.27	0.14
Mpongwe	3.95	0.30	1.97	-	1.32	0.36
Konkola	0.00					
Chambishi	4.57	0.35	2.28	-	1.52	0.42
(3) Central Province						
- Surface Water Projects	0.00					
- Groundwater Projects	32.38	13.74	9.42	-	6.27	2.95
Chibombo	1.83	0.14	0.91	-	0.61	0.17
Chisamba	0.61	0.05	0.30	-	0.20	0.06
Kapri Mposhi	7.28	3.47	1.89	-	1.26	0.66
Mumbwa	11.18	5.78	2.63	-	1.75	1.02
Namupundwe	1.67	0.46	0.64	-	0.42	0.15
Mukushi	4.19	1.16	1.59	-	1.06	0.38
Serenje	5.62	2.68	1.46	-	0.97	0.51
(4) Northwestern Pro.						
- Surface Water Projects	38.11	-	22.38	4.62	7.64	3.47
- Groundwater Projects	7.68	3.97	1.80	-	1.21	0.70
Solwezi	25.91	-	15.00	2.55	6.00	2.36
Mwinilunga	3.78	-	2.25	0.69	0.50	0.34
Zambezi	4.14	-	2.70	0.46	0.60	0.38
Chavuma	1.32	-	0.63	0.43	0.14	0.12
Kabompo	2.96	-	1.80	0.49	0.40	0.27
Mfumbwe	4.64	2.40	1.09	-	0.73	0.42
Kasempa	3.04	1.57	0.71	-	0.48	0.28
(5) Western Province						
- Surface Water Projects	12.09	-	7.70	1.41	1.88	1.10
- Groundwar Projects	18.92	1.54	9.40	-	6.25	1.73
Mongu	9.61	0.79	4.77	-	3.18	0.87
Limulunga	1.69	0.14	0.84	-	0.56	0.15
Namushakande	0.85	0.07	0.42	-	0.28	0.08
Lukulu	1.12	0.09	0.56	-	0.37	0.10
Kalabo	4.21	-	2.72	0.47	0.64	0.38
Sikongo	0.28	0.02	0.14	-	0.09	0.03
Kaoma	4.53	0.37	2.25	-	1.50	0.41
Senanga	4.71	-	3.00	0.48	0.80	0.43
Shangombo	0.28	0.02	0.14	-	0.09	0.03
Sesheke	3.17	-	1.98	0.46	0.44	0.29
Mulobezi	0.28	0.02	0.14	-	0.09	0.03
Katima-Mulilo	0.28	0.02	0.14	-	0.09	0.03

Projects	Total (Mil. US$)	Source Dev. (Mil. US$)	Treatment (Mil. US$)	Conveyance (Mil. US$)	Distribution (Mil.US$)	Eng. Services (Mil.US$)
(6) Southern Province						
- Surface Water Projects	4.50	-	2.25	1.34	0.50	0.41
- Groundwater Projects	52.19	17.64	17.85	-	11.95	4.75
Namwala	2.26	0.18	1.12	-	0.75	0.21
Itezhi-Tezhi	3.93	2.03	0.92	-	0.62	0.36
Mazabuka	8.48	0.69	4.21	-	2.81	0.77
Magoye	1.20	0.62	0.28	-	0.19	0.11
Nakambala	1.98	0.16	0.98	-	0.66	0.18
Nega-nega	0.57	0.05	0.28	-	0.19	0.05
Kafue-gorge	1.31	0.62	0.34	-	0.23	0.12
Chikankata	1.97	1.02	0.46	-	0.31	0.18
Monze	5.45	1.50	2.07	-	1.38	0.50
Chisekesi	0.77	0.37	0.20	-	0.13	0.07
Choma	10.09	4.80	2.62	-	1.75	0.92
Batoka	0.68	0.32	0.18	-	0.12	0.06
Pemba	0.92	0.44	0.24	-	0.16	0.08
Mbabala	0.51	0.14	0.19	-	0.13	0.05
Kalomo	5.28	1.46	2.00	-	1.34	0.48
Zimba	0.58	0.28	0.15	-	0.10	0.05
Siavonga	0.88	0.42	0.23		0.15	0.08
Chirundu	1.72	-	0.90	0.46	0.20	0.16
Gwembe	1.36	0.65	0.35	-	0.24	0.12
Sinazongwe	2.78	-	1.35	0.88	0.30	0.25
Maamba	3.97	1.89	1.03	-	0.69	0.36
(7) Luapula Province						
- Surface Water Projects	16.42	-	10.24	1.97	2.72	1.49
- Groundwater Projects	16.34	4.51	6.21	-	4.13	1.49
Mansa	14.74	4.07	5.60	-	3.73	1.34
Nchelenge	11.04	-	7.00	1.04	2.00	1.00
Chiengi	1.85	-	0.99	0.47	0.22	0.17
Kawambwa	0.33	0.09	0.13		0.08	0.03
Mwansabombwe	1.27	0.35	0.48	-	0.32	0.12
Mwense	0.00					
Samfya	3.53	-	2.25	0.46	0.50	0.32
(8) Northern Province						
- Surface Water Projects	0.00					
- Groundwater Projects	31.64	10.28	11.10	-	7.40	2.86
Kaputa	2.24	1.16	0.53	-	0.35	0.20
Mbala	4.64	2.40	1.09	-	0.73	0.42
Mpulungu	0.45	0.23	0.11	-	0.07	0.04
Mporokoso	2.00	0.55	0.76	-	0.51	0.18
Luwingu	1.09	0.30	0.41	-	0.28	0.10
Chilubi	0.45	0.23	0.11	-	0.07	0.04
Isoka	3.76	1.04	1.43	-	0.95	0.34
Nakonde	1.67	0.46	0.64	-	0.42	0.15
Chinsali	1.69	0.14	0.84	-	0.56	0.15
Mpika	13.65	3.77	5.18	-	3.46	1.24

Projects	Total (Mil. US$)	Source Dev. (Mil. US$)	Treatment (Mil. US$)	Conveyance (Mil. US$)	Distribution (Mil.US$)	Eng. Services (Mil.US$)
(9) Eastern Province						
- Surface Water Projects	0.00					
- Groundwater Projects	26.68	12.26	7.20	-	4.80	2.42
Chama	3.06	1.46	0.79	-	0.53	0.28
Lundazi	4.74	2.26	1.23	-	0.82	0.43
Chadiza	1.67	0.46	0.64	-	0.42	0.15
Katete	6.30	3.00	1.64	-	1.09	0.57
Petauke	8.59	4.09	2.23	-	1.49	0.78
Nyimba	1.74	0.83	0.45	-	0.30	0.16
Kacholola	0.58	0.16	0.22	-	0.15	0.05

Project Cost (Water Supply for Small Urban Areas) on Conservation Scenario

	Total (Mil. US$)	Source Dev. (Mil. US$)	Treatment (Mil. US$)	Conveyance (Mil. US$)	Distribution (Mil.US$)	Eng. Services (Mil.US$)
(1) Lusaka Province						
- Surface Water Projects	19.97	0.88	10.33	4.21	2.74	1.81
- Groundwater Projects	0.40	0.07	0.17	-	0.12	0.04
Chongwe	2.89	0.88	0.90	0.65	0.20	0.26
Kafue	11.92	-	7.00	1.84	2.00	1.08
Chilanga	4.32	-	2.16	1.29	0.48	0.39
Rufunsa	0.40	0.07	0.17	-	0.12	0.04
Luangwa	0.84	-	0.27	0.43	0.06	0.08
(2) Copperbelt Province						
- Surface Water Projects	0.00					
- Groundwater Projects	2.12	0.16	1.07	-	0.70	0.19
Masaiti	0.00					
Mpongwe	1.21	0.09	0.61	-	0.40	0.11
Konkola	0.00					
Chambishi	0.91	0.07	0.46	-	0.30	0.08
(3) Central Province						
- Surface Water Projects	0.00					
- Groundwater Projects	9.14	3.60	2.83	-	1.87	0.84
Chibombo	0.91	0.07	0.46	-	0.30	0.08
Chisamba	0.30	0.02	0.15	-	0.10	0.03
Kapri Mposhi	1.61	0.76	0.42	-	0.28	0.15
Mumbwa	3.14	1.62	0.74	-	0.49	0.29
Namupundwe	0.33	0.09	0.13	-	0.08	0.03
Mukushi	1.58	0.44	0.60	-	0.40	0.14
Serenje	1.27	0.60	0.33	-	0.22	0.12
(4) Northwestern Pro.						
- Surface Water Projects	10.00	-	5.31	2.25	1.54	0.90
- Groundwater Projects	3.22	1.67	0.76	-	0.50	0.29
Solwezi	6.30	-	3.78	0.75	1.20	0.57
Mwinilunga	1.31	-	0.45	0.64	0.10	0.12
Zambezi	1.69	-	0.90	0.44	0.20	0.15
Chavuma	0.70	-	0.18	0.42	0.04	0.06
Kabompo	0.00					
Mfumbwe	2.24	1.16	0.53	-	0.35	0.20
Kasempa	0.98	0.51	0.23	-	0.15	0.09
(5) Western Province						
- Suface Water Projects	6.43	-	3.69	1.34	0.82	0.58
- Groundwar Projects	6.49	0.52	3.22	-	2.14	0.61
Mongu	2.26	0.18	1.12	-	0.75	0.21
Limulunga	0.57	0.05	0.28	-	0.19	0.05
Namushakande	0.28	0.02	0.14	-	0.09	0.03
Lukulu	0.57	0.05	0.28	-	0.19	0.05
Kalabo	2.43	-	1.44	0.45	0.32	0.22
Sikongo	0.28	0.02	0.14	-	0.09	0.03
Kaoma	1.69	0.14	0.84	-	0.56	0.15
Senanga	2.31	-	1.35	0.45	0.30	0.21
Shangombo	0.28	0.02	0.14	-	0.09	0.03
Sesheke	1.69	-	0.90	0.44	0.20	0.15
Mulobezi	0.28	0.02	0.14	-	0.09	0.03
Katima-Mulilo	0.28	0.02	0.14	-	0.09	0.03

Projects	Total (Mil. US$)	Source Dev. (Mil. US$)	Treatment (Mil. US$)	Conveyance (Mil. US$)	Distribution (Mil.US$)	Eng. Services (Mil.US$)
(6) Southern Province						
- Surface Water Projects	2.75	-	0.99	1.29	0.22	0.25
- Groundwater Projects	10.87	3.33	3.91	-	2.62	1.01
Namwala	0.57	0.05	0.28	-	0.19	0.05
Itezhi-Tezhi	1.29	0.67	0.30	-	0.20	0.12
Mazabuka	2.54	0.21	1.26	-	0.84	0.23
Magoye	0.35	0.18	0.08	-	0.06	0.03
Nakambala	0.57	0.05	0.28	-	0.19	0.05
Nega-nega	0.28	0.02	0.14	-	0.09	0.03
Kafue-gorge	0.39	0.18	0.10	-	0.07	0.04
Chikankata	0.58	0.30	0.14	-	0.09	0.05
Monze	0.51	0.14	0.19	-	0.13	0.05
Chisekesi	0.24	0.12	0.06	-	0.04	0.02
Choma	0.00					
Batoka	0.30	0.14	0.08	-	0.05	0.03
Pemba	0.30	0.14	0.08	-	0.05	0.03
Mbabala	0.17	0.05	0.06	-	0.04	0.02
Kalomo	1.18	0.32	0.45	-	0.30	0.11
Zimba	0.00					
Siavonga	0.00					
Chirundu	0.97	-	0.36	0.44	0.08	0.09
Gwembe	0.44	0.21	0.11	-	0.08	0.04
Sinazongwe	1.78	-	0.63	0.85	0.14	0.16
Maamba	1.16	0.55	0.30	-	0.20	0.11
(7) Luapula Province						
- Surface Water Projects	8.02	-	4.71	1.40	1.18	0.73
- Groundwater Projects	4.68	1.29	1.78	-	1.18	0.43
Mansa	4.35	1.20	1.65	-	1.10	0.40
Nchelenge	4.74	-	3.00	0.51	0.80	0.43
Chiengi	1.22	-	0.54	0.45	0.12	0.11
Kawambwa	0.00					
Mwansabombwe	0.33	0.09	0.13	-	0.08	0.03
Mwense	0.00					
Samfya	2.06	-	1.17	0.44	0.26	0.19
(8) Northern Province						
- Surface Water Projects	0.00					
- Groundwater Projects	12.27	3.74	4.45	-	2.96	1.12
Kaputa	1.16	0.60	0.27	-	0.18	0.11
Mbala	0.89	0.46	0.21	-	0.14	0.08
Mpulungu	0.00					
Mporokoso	1.00	0.28	0.38	-	0.25	0.09
Luwingu	0.33	0.09	0.13	-	0.08	0.03
Chilubi	0.09	0.05	0.02	-	0.01	0.01
Isoka	1.77	0.49	0.67	-	0.45	0.16
Nakonde	0.66	0.18	0.25	-	0.17	0.06
Chinsali	0.85	0.07	0.42	-	0.28	0.08
Mpika	5.52	1.52	2.10	-	1.40	0.50

Projects	Total (Mil. US$)	Source Dev. (Mil. US$)	Treatment (Mil. US$)	Conveyance (Mil. US$)	Distribution (Mil.US$)	Eng. Services (Mil.US$)
(9) Eastern Province						
- Surface Water Projects	0.00					
- Groundwater Projects	11.11	5.16	2.97	-	1.98	1.00
Chama	1.55	0.74	0.40	-	0.27	0.14
Lundazi	1.69	0.81	0.44	-	0.29	0.15
Chadiza	0.43	0.12	0.16	-	0.11	0.04
Katete	3.11	1.48	0.81	-	0.54	0.28
Petauke	3.40	1.62	0.88	-	0.59	0.31
Nyimba	0.68	0.32	0.18	-	0.12	0.06
Kacholola	0.25	0.07	0.10	-	0.06	0.02

A2.3.3 Rural Areas

Annual Cost Disbursement (Rural Areas)

Provinces and Projects	Construction Cost (Mil.us$)	Annual Cost Disbursement (%)																		
		'96	97	98	99	00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15
(1) Lusaka Province	10.14	4	4	4	4	4	4	4	4	4	4	6	6	6	6	6	6	6	6	6	6
(2) Copperbelt Province	15.85	0	4	4	4	4	5	5	5	5	8	6	6	6	6	6	6	6	6	6	6
(3) Central Province	26.36	4	7	7	7	4	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5
(4) Northwestern Province	16.20	0	3	3	3	3	4	4	4	4	8	6	6	6	6	6	6	6	6	6	6
(5) Western Province	9.84	6	6	6	6	6	7	7	7	7	7	3	3	3	3	3	3	3	3	3	3
(6) Southern Province	32.70	1	3	3	3	3	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6
(7) Luapul Province	19.23	0	3	3	3	3	4	3	3	3	7	7	7	7	7	7	7	7	7	7	7
(8) Northern Province	32.98	0	3	3	3	3	4	4	4	4	6	7	7	7	7	7	7	7	7	7	7
(9) Eastern Province	46.22	0	4	4	4	4	6	6	6	6	6	5	5	5	5	5	5	5	5	5	5

A2.3.4 Drilling Center Projects

Annual Cost Disbursement (Drilling Centers)

Provinces and Projects	Construction Cost (Mil.us$)	Annual Cost Disbursement (%)																		
		'96	97	98	99	00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15
(1) Lusaka Province	13.40	100																			
(2) Copperbelt Province	6.46	52								48											
(3) Central Province																					
(4) Northwestern Province	6.46	52								48											
(5) Western Province																					
(6) Southern Province																					
(7) Luapul Province	6.46	52								48											
(8) Northern Province	9.57	68								32											
(9) Eastern Province	12.69	100