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Zambia Water Supply and Sanitation Sector Diagnostic

Narrowing the Gap between Policy and Practice

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Abbreviations

7NDP	Seventh National Development Plan
AfDB	African Development Bank
CLTS	community-led total sanitation
CP	cooperating partner
CSO	Central Statistical Office
CU	commercial utilities
DDCC	District Development and Coordination Committee
DFID	Department for International Development
DHIS	District Health Information System
DHS	Demographic and Health Survey
DWSS	Department of Water Supply and Sanitation
D-WASHE	District Water, Sanitation, and Hygiene Education
ERR	economic rate of return
ETE	end-of-term evaluation
ETR	end-of-term review
FSM	fecal sludge management
GDP	gross domestic product
GIZ	Deutsche Gesellschaft für Internationale Zusammenarbeit
GRZ	government of the Republic of Zambia
IMF	International Monetary Fund
IMS	information management system
JICA	Japan International Cooperation Agency
JMP	Joint Monitoring Programme
l/c/d	liter per capita per day
LCMS	Living Conditions Monitoring Survey
LWSC	Lusaka Water and Sanitation Company
MDG	Millennium Development Goal
M&E	monitoring and evaluation
MLGH	Ministry of Local Government and Housing (former)

MoF	Ministry of Finance
MTR	midterm review
MWDSEP	Ministry of Water Development, Sanitation, and Environmental Protection
NDP	national development plan
NGO	nongovernmental organization
NRW	nonrevenue water
NRWSSP	National Rural Water Supply and Sanitation Program
NUWSSP	National Urban Water Supply and Sanitation Program
NWASCO	National Water Supply and Sanitation Council
O&M	operations and maintenance
ODF	open defecation-free
OSS	on-site sanitation system
PDCC	Provincial Development and Coordination Committee
PDWSS	Provincial Department of Water Supply and Sanitation
PPP	public-private partnership
PS	permanent secretary
PSC	Program Steering Committee
P-WASHE	Provincial Water, Sanitation, and Hygiene Education
RWSS	rural water supply and sanitation
SDG	Sustainable Development Goal
SIP	sector investment plan
SLTS	school-led total sanitation
SNDP	Sixth National Development Plan
SOMAP	sustainable operations and maintenance project
UNICEF	United Nations Children's Fund
U.S.	United States
V-WASHE	Village Water, Sanitation, and Hygiene Education
WARMA	Water Resources Management Authority
WASH	water, sanitation, and hygiene

WHO	World Health Organization
WSS	water supply and sanitation
WWG	water watch group
ZEMA	Zambia Environmental Management Agency

Executive Summary

Access to water supply and sanitation (WSS) services remains stubbornly low in Zambia. As of 2017, about 67 percent of Zambians had access to an improved water source, and only about 44 percent had access to an improved sanitation facility. However, there are disparities between rural and urban. Access to improved water in rural areas is at 51 percent, whereas urban is 89 percent. Sanitation access in rural areas is at 19 percent, whereas urban is 49 percent. Approximately 19 percent of Zambians practice open defecation. Zambia is one of the countries that missed the Millennium Development Goals (MDGs) on access to water and sanitation and is on track to miss the more ambitious Sustainable Development Goals (SDGs). Access rates have remained almost stagnant over the past 15 years. Even where there is access, the quality of service is poor, especially in small rural towns and peri urban areas. Households receive an average of 16 hours of water supply per day, 6 percent of water samples in urban areas fail bacteriological tests, and sanitation and sewer collection and treatment remain poor.

This poor record on WSS service delivery is disastrous for Zambia's economy by negatively affecting human capital development, which in turn creates a drag on the economy. A World Bank (2017) study shows that Zambia's poor WSS service is partly responsible for the high levels of childhood stunting (40 percent) in the country, which represents a staggering loss of human potential in Zambia. Cholera outbreaks are also a common occurrence. The most recent outbreak in October 2017 resulted in 5,900 cases and claimed 114 lives.

Successive governments in Zambia have recognized this important sector of the economy and launched reforms and investment programs. Several bold institutional changes have been implemented in the WSS sector since 1994, starting with the National Water Policy of 1994 (revised in 2008 and under review as of 2020), which is based on principles of separation of water resource management from WSS service provision; separation of regulatory and executive functions; devolution of service provision functions to local authorities (municipalities and districts) and private enterprise; and achieving full cost recovery for WSS through tariffs. Key reforms included the establishment of 11 regional commercial utilities (CUs) to replace fragmented service provision by local governments, as well as an independent regulator—the National Water Supply and Sanitation Council (NWASCO)—to oversee the CUs and other service providers. However, these reforms have not translated into increased coverage and quality of services.

Major flagship programs have so far failed to close the service gap. Two flagship national programs—the National Rural Water Supply and Sanitation Program (NRWSSP) and the National Urban Water Supply and Sanitation Program (NUWSSP)—were conceived in 2005 and 2011, respectively, to accelerate improvements in WSS coverage across the country. The first phase of NRWSSP (2005-15), with a total expenditure of US$270 million, only managed to increase rural water coverage from 37 to 44 percent (compared with a program target of 75 percent) and rural sanitation coverage from 13 to 19 percent during the 10 years. The second phase of NRWSSP (2016-30), with an estimated cost of US$1.8 billion, has an even more ambitious goal—to increase rural water coverage to 100 percent and rural sanitation to 90 percent by 2030. However, the program is still struggling to secure adequate funding. The NUWSSP (2011-30) is on target to deliver the planned capital expenditure (US$4.08 billion), but urban water

supply coverage has not increased at all since the program started in 2011. Given these challenges, a systematic diagnostic through the lens of both programs may provide insights into some of the bottlenecks that may be keeping the sector behind.

We analyzed these two investment programs to identify opportunities to enhance their effectiveness and impact. The primary question addressed is: how can the design and implementation of the government's flagship WSS programs be improved to enhance their effectiveness and outcomes? Specific questions were: (a) What is the strategic relevance of the WSS programs to Zambia's economy? (b) To what extent are the flagship WSS programs designed, organized, and implemented to efficiently produce results? (c) Does the existing sector expenditure framework support efficient program implementation? and (d) What opportunities exist to enhance the effectiveness and outcomes of the programs? We employed the following methods to answer these questions: (a) systematic review of more than 50 sector documents, including but not limited to program documents, midterm and end-of-term evaluation of programs, and annual sector reports and (b) more than 30 key informant interviews and focus group discussions with central government ministries and agencies, district local governments, water utilities, sector development partners, and the private sector.

Our findings confirm the strategic relevance of both WSS programs to Zambia's economy. The government of the Republic of Zambia (GRZ) has clearly articulated access to quality water and sanitation services as a priority issue for economic development and poverty reduction. The two national programs feature prominently in Zambia's 2030 vision, the Sixth National Development Plan (SNDP), and the Seventh National Development Plan (7NDP). Also, several documents by GRZ's development partners, including the World Bank's Country Partnership Framework, identify low WSS as a bottleneck to development. Conservative estimates suggest that Zambia loses US$194 million every year because of poor sanitation, a loss equivalent to 1.3 percent of the country's gross domestic product (GDP) (World Bank 2012). For this study, a sample of eight projects from both the NRWSSP and NUWSSP were analyzed for economic impact. The analysis yielded an economic rate of return in the range of 11 to 29 percent, suggesting that the economic rationale for both programs is sound.

However, the two programs are not structured to efficiently deliver on the service outcomes that the government seeks. Although the type of program activities is generally adequate to achieve objectives, more emphasis remains on the creation of infrastructure rather than strengthening the capacity for service provision. For instance, although the first phase of the NRWSSP exceeded its water point targets, coverage lagged as a result of fewer users per water point and the fact that at the end of the program period, more than 30 percent of the water points were not functioning. Similarly, the NUWSSP has driven considerable investment in increased water provision across the CUs; however, service coverage and quality have not changed much because most of the capital has gone into large bulk water production projects. Rehabilitation and expansion of aging water distribution networks, especially in small towns and periurban areas, has not received the same level of attention. Consequently, most of the increased production is lost in leaky networks, thus undermining the ability to expand coverage. Sanitation has received limited capital investments in both rural and urban areas. The NRWSSP investments on rural sanitation are limited mainly to creating community awareness using voluntary community

champions—a strategy that has proved ineffective in changing behavior (open defection has remained at 19 percent for the past 10 years).

Institutional capacity for planning, implementation, and monitoring and evaluation (M&E) is weak. Both programs are, in practice, guiding frameworks, with no clear guidelines for planning and execution and no mechanism for investment prioritization. For the NRWSSP, the division of roles among districts, provinces, and the Ministry of Water Development, Sanitation, and Environmental Protection (MWDSEP) remains unclear—a reflection of an incomplete devolution process. Some projects are implemented by the MWDSEP directly, others by districts. However, there is a severe lack of human resources at the provincial and district levels with vacancies of more than 90 percent of WSS staff positions. Consequently, there is limited capacity at the local level for planning, implementation, and monitoring of program investments. CUs mainly drive the NUWSSP, but there are no mechanisms to hold either districts and CUs accountable for performance (M&E is especially weak in the rural program). In short, both programs are affected by broader public sector governance issues, including the slow pace of decentralization and lack of accountability.

Even worse, the existing sector expenditure framework does not support efficient program implementation. Although the GRZ's medium-term and annual budget frameworks provide a sound basis for prioritization of expenditures in line with national development plans (NDP), historical budget allocations to the WSS sector show a declining trend. The annual average budget allocation to the sector programs was US$140 million per year under the SNDP and fell to US$80 million per year under the 7NDP, and both are well below the estimated costs for the rural and urban programs. Worse still, the budget allocations approved by the Ministry of Finance (MoF) are almost always lower than those in the NDP, and actual releases are always lower than the approved budget. In some years, releases have fallen to only 40 percent of the budgeted amount. Budget execution is also weak, with large persistent deviations (40 to 66 percent) between expenditure outturns and approved budgets. In short, the GRZ's medium-term budget does not reflect the cost of the activities needed to achieve the objectives of both programs, and there are questions about the government's ability to execute its budgeted expenditures.

The NRWSSP is starved of funds. Budget allocations and releases are inconsistent with the program's ambitions. Planned NRWSSP expenditure for 2016-20 is US$330 million, or US$66 million per year. However, actual MoF allocations for rural water supply and sanitation (RWSS) was only US$14 million per year from 2016-18. For 2021-30, the planned expenditure is US$1.2 billion, about US$120 million per year. Raising this level of funding will be a significant challenge. Although donor-funding agencies provide most of the financing of the sector (about 70 percent), funding predictability is low, and most of the funding is provided off-budget and is, therefore, difficult to track.

The NUWSSP, on the other hand, is better funded. Most of the funding is based on loan or grant agreements signed by the GRZ and donors for specific projects. From 2013-18, the GRZ was able to mobilize US$925 million for the NUWSSP. Total signed commitments for the period 2013-30 is about US$2.7 billion, which represents about 67 percent of the overall program cost (US$4.08 billion). The GRZ, therefore, needs to raise US$1.3 billion (about 33 percent of the total program cost) over the next decade. Based on

their track record, raising this level of capital for the urban program is feasible, provided the GRZ can expand the fiscal space.

The government has insufficient fiscal space to fund both programs. Together, they need funding well above 1 percent of GDP per year to compensate for the historically low spending (average 0.3 percent of GDP) in the sector. However, the GRZ is currently restraining fiscal expenditure as one of the measures to deal with the current public debt situation. Public debt has risen from US$7.4 billion in 2013 to US$18.3 billion in 2018, taking Zambia's public debt-to-GDP ratio from 27 to 78 percent, thus reducing fiscal space drastically. The GRZ's actions to confront this unsustainable situation include the halting of expensive public, commercial debt (currently at US$5.1 billion) and improving the effectiveness of new concessional debt. In this context, a financing strategy for the sector must include deliberate measures to create fiscal space.

Our analysis shows that Zambia's chronically inefficient water utilities are creating a fiscal burden and making it harder for the government to finance the sector. From 2001-17, Zambia's CUs lost an estimated US$858 million from high levels of nonrevenue water and low bill collection efficiency. Most of the losses (US$554 million) occurred from 2011-17 and was equivalent to about 20 percent of the total capital so far invested in the NUWSSP. From a public finance perspective, the inefficiencies have resulted in hidden costs or unintentional implicit subsidies to the CUs that can be considered an illegitimate claim on public resources. Unlike direct subsidies, which are formally allocated and recorded on the utilities' books, hidden costs are accumulated by CUs yet go unrecorded, thereby creating a fiscal burden on the government. There is evidence that CUs are compensating by reducing investment in maintaining their assets. They also delay or forgo essential maintenance and repairs—actions that trigger a downward spiral of significant deterioration in assets, declining service quality and increasing cost for each unit of service provided. When this happens, losses increase substantially, and more investment is required to carry out repairs. This vicious cycle, which begins with hidden costs and proceeds to asset deterioration, means that when the government finally absorbs the costs, it does so only by adding to the national debt or reducing funding for other programs.

These findings have several implications for the government's flagship WSS programs. First, the scope needs to be reviewed to include activities designed to enhance the institutional capacity of districts and CUs to plan, implement, and monitor the programs. Second, the programs must be anchored within the sector institutional structure, not merely as guiding frameworks but as budget-holding programs with the necessary implementation guidelines, governance mechanisms, and clarity of roles to hold both CUs and local governments accountable. Third, there is a need to develop a methodology for prioritizing investments, especially for the urban program, which appears heavily skewed toward bulk water production, with limited attention to sanitation, water distribution network improvements, and reduction of losses. In this regard, the GRZ should consider an investment policy that prioritizes investments in reducing water losses. One practical way to operationalize such a strategy is to require CUs seeking public financing to define investment packages that balance the reduction of leakage against the development of new production sources. Furthermore, to improve public health impact, the GRZ should make use of public health data to target and prioritize WSS investments that yield the most significant reduction in public health risks. A recent study of WSS investment scenarios in Lusaka found that improving

the targeting of interventions results in a higher cholera risk reduction of between 35 to 51 percent, compared with the baseline scenario (24 percent). Finally, a credible sector financing strategy and funding mechanism is urgently needed to address funding shortfalls, especially for the rural program. Given that the GRZ has minimal fiscal space for new loans, a credible financing strategy for both programs must contribute to the creation of fiscal space. Such a strategy may include, for instance, mobilizing donor grants to fund the NRWSSP or combining the two programs into one and blending donor grants with concessional and nonconcessional financing. The GRZ will also need to develop coordinated and flexible funding arrangements to improve the efficiency of external donor financing by bringing a greater share of funding on-budget through pooled financing, using sector investment plans to strengthen prioritization, traceability of funds, and reporting.

Furthermore, sanitation will require new public financing mechanisms that recognize the public good aspects of sanitation. Sanitation is predominantly financed by households, but this model has failed to close the access gap. Moreover, significant public investments will soon be required as people move up the sanitation ladder, especially in small towns. As of 2020, the ongoing Lusaka Sanitation Program is the only large-scale public investment in sanitation in Zambia. However, the unprecedented capital injection (US$300 million) will require a rethink of existing financing mechanisms for urban sanitation services to ensure sustainability.

For urban water supply, the GRZ should have a deliberate strategy to use public finances to incentivize efficiency improvements in CUs by linking financing to verifiable improvements in operational efficiency. Future concessional funding to CUs under the NUWSSP should be linked to improvements in operational efficiency, which would improve financial performance and enable CUs to contribute to capital investments through improved cash flows. Data from NWASCO show that average tariffs for CUs in Zambia are well above average operations and maintenance (O&M) costs and can cover some financial costs. However, high levels of losses and operational inefficiencies are preventing CUs from accessing private capital. Therefore, any future capital injection by the GRZ in the NUWSSP must consider interventions to improve the efficiency of CUs, which would make them more credit worthy and thus increase their chances of mobilizing private capital. In short, our analysis provides overwhelming evidence to support a shift in the focus of the NUWSSP toward efficiency improvement.

These changes to program design and implementation must be complemented with medium-term actions to advance Zambia's WSS sector reforms and narrow the gap between policy and practice. Zambia's WSS reform program, which has been the envy of many countries in Africa, has yet to deliver on its promise, the critical issue being the incomplete implementation of the reforms. There is a widespread consensus on the areas in which greater emphasis is needed. First, there is a need to strengthen corporate governance of CUs and increase managerial autonomy and accountability. This may require changes to the Water Supply and Sanitation Act of 1997 to empower the shareholders of CUs (local authorities) and introduce mixed ownership (public and private)—all aimed at reducing the risk of arbitrary central government interventions in the management of utilities. Second, there is a need to strengthen the policy role of the MWDSEP by linking public financing to policy and service delivery goals that the GRZ seeks to achieve at the local level. Third, there is a need to rethink existing community management models for water supply services in rural areas and get better data on actual implementation and O&M to modify

the current models. Fourth, urgent intervention is needed to strengthen M&E, mainly in the rural sector. Finally, new reforms are urgently needed to unlock sector finance, with efficiency improvements in CUs taking center stage. There is also a need to establish and institutionalize public financing mechanisms for sanitation that recognize the public good aspects of sanitation (such as the use of a sanitation surcharge for all water consumers).

Finally, the government will need to address broader public sector governance constraints, particularly the slow pace of decentralization and the low capacity at the district level—a key obstacle for the NRWSSP implementation. Although this challenge is not unique to WSS, the sector can provide an entry point to advance the decentralization agenda through instruments, such as intergovernmental transfers earmarked for water and sanitation and performance agreements between the MWDSEP and districts or CUs and improved delivery of essential WSS services. It is also recommended to expand the mandate of CUs to cover rural areas, as much as possible, to reduce the demand on capacity-constrained districts.

In conclusion, water supply and sanitation are important economic development issues for Zambia, but progress has remained static despite the efforts of the government and others. Decades of reform and government programs are failing to deliver on their promise, and time is running out. Although major public health crises, such as the recent cholera outbreaks, make the news, there is a more silent crisis hidden away from the headlines—the millions of stunted children in Zambia who are never going to realize their full potential. Inadequate WSS is partly responsible. This study has proposed evidence-based actions that the GRZ can take to enhance the effectiveness and outcomes of its investment programs. The proposed changes do not require any radical change in policy or implementation arrangements but do need some hard decisions on roles and responsibilities and an increased focus on the efficiency of CUs to close the investment financing gap. If the GRZ accepts these proposals, the performance of the programs is likely to improve. On the other hand, if no action is taken, then Zambia has little chance of breaking out of the cycle of low investment and low levels of access to water and sanitation services.

Chapter 1
Introduction

Context

Zambia's population is estimated at 17 million. The country is one of the most urbanized in Sub-Saharan Africa, with approximately 45 percent of the population (8 million people) living in urban areas, and about half of those in small towns and rural growth centers. About 54.4 percent of Zambians live in poverty (national poverty line), with rural poverty rates markedly higher at 76.7 percent. Extreme poverty in rural areas is at 60.8 percent, substantially above the average for Sub-Saharan Africa. Zambia has a Human Capital Index of 0.4, which means a child born in Zambia today will be 40 percent as productive when she grows up as she could be if she enjoyed complete education and full health.

Zambia witnessed an impressive growth rate averaging about 7 percent from 2006–14. As a result of the sustained economic growth exhibited over these years, the World Bank reclassified Zambia as a lower middle-income country in 2011. Economic growth slowed after 2014, falling to 3.5 percent in 2015, 3.2 percent in 2016, 3.4 percent in 2017, and 3.7 percent in 2018. The leading causes of the initial slowdown in growth were plummeting copper prices and the 2015-16 drought, which resulted in a poor agriculture harvest and electricity shortages, which led to substantial expenditure on imports of electricity. The fall in economic growth exacerbated preexisting fiscal and macroeconomic challenges. Since 2012, successive fiscal expansionary budgets have resulted in a significant increase in debt stock from 20.8 percent of gross domestic product (GDP) in 2011 to 64.8 percent of GDP in 2018. Debt service as a share of revenues has increased from 29 percent in 2017 to an estimated 42 percent in 2019. The high debt-service costs have crowded out productive and poverty reduction spending on other sectors of the economy and further constrained economic growth.

The water supply and sanitation (WSS) sector plays a critical role in Zambia's economy. Conservative estimates by the World Bank (2012) suggest that Zambia loses US$194 million every year as a result of poor sanitation, equivalent to 1.3 percent of the country's GDP. The loss is caused by deaths from diarrhea (US$167 million), loss of productivity while sick (US$1.0 million), health care costs (US$10.6 million), and access time for people practicing open defecation to find a private location to defecate (US$16 million). From a public health perspective, inadequate water, sanitation, and hygiene are the leading causes of infections, such as cholera and diarrhea, and the leading cause of death of children under the age of 5. Cholera outbreaks, in particular, are a common occurrence in Zambia. The most recent outbreak in October 2017 resulted in 5,900 cases, claimed 114 lives, and caused massive economic disruption. In Zambian schools, lack of access to adequate water supply, sanitation, and washing facilities negatively affects students and contributes to high dropout rates, especially among girls. A World Bank (2017) study also found that poor WSS service in Zambia is partly responsible for the high levels (40 percent) of childhood stunting. Studies show that the economic returns on water and sanitation projects in Zambia are highly favorable. A global survey by the World Health Organization (2012) estimated the benefit-cost ratio of water supply investments in Zambia at 1.7 and sanitation at 3.1, under conservative assumptions.

However, Zambia has low and stagnating coverage of less than 65 percent for water and less than 45 percent for sanitation (using national statistics and definitions). Coverage data, however, are variable across different sources (see table 1.1). The three primary data sources used in this report are the end-of-term evaluation (ETE) of the National Rural Water Supply and Sanitation Program (NRWSSP) 2006-15 (MGH 2015) the draft 2014 Zambia Joint Water Sector Review (Anon-ZAMBIA 2017),and the global Joint Monitoring Programme (JMP) update on Sustainable Development Goals (SDGs) (WHO/UNICEF 2017a). All the reports highlight the problem of data. For example, the ETE estimated rural water coverage in 2015 at 55 percent, but the JMP reported 44 percent in 2017. Although the variations are substantial, the overall conclusion remains that Zambia has not made much progress on household WSS access over the past 15 years. The situation in schools and health centers is no better, although data availability is still a challenge. According to WHO/UNICEF (2017a) data, drinking water access in schools is at about 79 percent, and sanitation is at 66 percent. Only about 40 percent of health centers in Zambia have access to water services, and 7 percent have no sanitation service at all.

When compared with other African countries using internationally comparable definitions and statistics for basic coverage, Zambia is trailing Malawi, South Africa, and Zimbabwe (figure 1.1). Also, there are significant disparities in access between rural and urban areas and between different regions of the country. Coverage data in table 1.1 show that urban areas consistently maintain higher levels of WSS access than rural areas. Generally, urban provinces, such as Copper belt and Lusaka, have overall better access than less urbanized ones.

The quality of service is also relatively high in urban areas, with an average of 18 hours of supply per day and 95 percent compliance with national drinking water quality standards. There is no systematic data set on quality of service in rural areas to date.

TABLE 1.1. Coverage Data on Improved Water and Sanitation Services at the Household Level

	NRWSSP, NUWSSP	NWASCO	MTR[a]	ETR(1)	ETR(2)	DHS[b]	LCMS[c]	JMP[d]
Source	**2005**	**2009**	**2010**	**2010**	**2012**	**2013-14**	**2015**	**2015**
Rural water supply	37%	–	46%	41%	–	47%	52%	44%
Rural sanitation	13%	–	43%	33%	–	20%	11%	19%
Urban water supply	86%	74%	–	–	–	89%	89%	86%
Urban sanitation	41%	–	–	–	–	39%	57%	49%
Overall water supply	53%	–	–	–	65%	63%	68%	61%
Overall sanitation	23%	–	–	–	48%	27%	31%	31%

Sources: GRZ 2007, 2011a, 2013, 2016; MLGH 2015; CSO *(Central Statistical Office, Zambia), MoH (Ministry of Health, Zambia), and ICF International. 2015; WHO/UNICEF 2017a.*

Note: DHS = Demographic and Health Survey; ETR = end-of-term review; JMP = Joint Monitoring Programme; LCMS = Living Conditions Monitoring Survey; MTR = midterm review; NRWSSP = National Rural Water Supply and Sanitation Program; NUWSSP = National Urban Water Supply and Sanitation Program; NWASCO = National Water Supply and Sanitation Council.

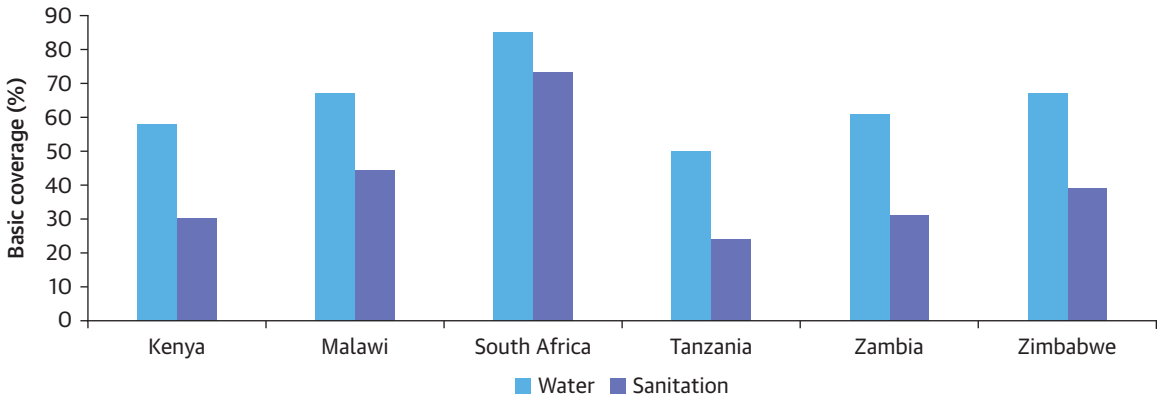
a. MTR (of NRWSSP) uses the JMP data.

b. DHS classifies shared sanitation facilities as "unimproved."

c. LCMS assumes improved sanitation is own facility and "with slab" for pit latrines.

d. JMP is the World Health Organization (WHO)/United Nations Children's Fund (UNICEF) JMP global report.

FIGURE 1.1. WSS Coverage 2015 (Regional Snapshot)



Source: WHO/UNICEF 2017a.

Service providers are under performing on basic operational performance indicators. Data from the National Water Supply and Sanitation Council (NWASCO) (table 1.2) show that commercial utilities (CUs) are, on average, unable to account for 47 percent of the water they produce, a large proportion of customers remain unmetered, and staff productivity ratio is one of the highest in the region.[1] Consequently, more than half of the CUs are struggling to cover operations and maintenance (O&M) costs from revenues, despite having a relatively favorable tariff regime.[2]

National WSS Programs

In the past decade, Zambia has launched two flagship programs in the water sector supported by a decentralization reform. The NRWSSP and the National Urban Water Supply and Sanitation Program (NUWSSP) were introduced to improve WSS services across the country. The first phase of the NRWSSP (2005-15) had a total expenditure of US$270 million (GRZ 2007), which this raised water coverage from 37 to 44 percent and sanitation coverage from 13 to 19 percent. The second phase of the NRWSSP (2016-30), with an estimated cost of US$1.8 billion (GRZ 2018a), aims to raise water coverage to 100 percent and sanitation to 90 percent by 2030. The NUWSSP, on the other hand, is a 20-year program that has been under implementation since 2011 and appears on course to deliver the planned capital expenditure of US$4.08 billion by 2030 (GRZ 2011a).

The two programs are comprehensive national investment frameworks for the entire WSS subsector. However, the government of the Republic of Zambia (GRZ) has struggled to close the access gap through them. The first phase of the NRWSSP planned to increase rural water coverage to 75 percent but only achieved 44 percent despite constructing the planned number of water points. The average number of people served per water point was, therefore, significantly less than planned. The program was mainly funded by international funding agencies with limited GRZ funding. Table 1.3 summarizes the key figures for the first phase of the NRWSSP.

TABLE 1.2. Performance Indicators for Urban WSS Services

CUs	Water service coverage (%)	Sanitation coverage (%)	NRW (%)	Metering ratio (%)	Hours of supply	O&M cost recovery (%)	Staff per 1,000 water connections	Production	
								m^3/d (thousand)	l/c/d
Chambeshi	80.30	41.80	49	49	15	82	11	32.6	116
Eastern	62.90	33.60	51	67	16	88	8	14.8	76
Kafubu	81.10	71.10	64	70	18	112	10	156	271
Luapula	37.60	31.90	77	97	19	49	11	14	167
Lukanga	78.40	39.70	52	76	20	82	10	39.7	118
Lusaka	85.40	73.70	46	64	18	122	9	235	133
Mulonga	97.30	81.80	39	80	17	109	8	134	266
Nkana	96.20	74.30	48	80	17	97	10	140	183
North-Western	86.70	21.80	39	100	20	88	8	14.5	62
Southern	88.00	59.40	35	78	22	107	8	59.5	142
Western	82.40	31.30	42	100	20	69	10	18.6	105
Average	84.30	62.50	47	74	18	105	-	-	-
Benchmark	80	80	25	100	18	100	-	-	-

Source: NWASCO 2017.

Note: CU = commercial utility; l/c/d = liters per capita per day; m^3/d = cubic meters per day; NRW = non revenue water; O&M = operations and maintenance; WSS = water supply and sanitation.

The second phase of the NRWSSP is even more ambitious, aiming to increase rural water coverage to 100 percent and rural sanitation to 90 percent by 2030 at an estimated cost of US$1.8 billion. To achieve these targets, and to take 2015 as the baseline year, the program will need to provide safe water to an additional 8.8 million people and improved sanitation to an additional 8.9 million people by 2030. The program design assumes that 55 percent of the required funding will come from external financing institutions, 30 percent from the GRZ, 10 percent from local authorities, and 5 percent from communities. However, the GRZ is struggling to raise the required capital for the program. The NUWSSP, on the other hand, is on target to deliver the planned expenditure and related infrastructure, but urban coverage has remained stagnant since its conception in 2011.

Study Objectives and Methodology

The objective of this study is to identify opportunities for enhancing the effectiveness and impact of government programs in the WSS subsector. The study focuses on the GRZ's two flagship programs: the NRWSSP and the NUWSSP.

The primary question addressed is: how can the design and implementation of the government's flagship WSS programs be improved to enhance their effectiveness and outcomes? Specific questions were: (a) What is the strategic relevance of the WSS programs to Zambia's economy? (b) To what extent are the flagship WSS programs designed, organized, and implemented to efficiently produce results? (c) Does the existing sector expenditure framework support efficient program

TABLE 1.3. NRWSSP Phase I: Planned and Actual

	Unit	Planned	Actual
Total water points constructed/rehabilitated	Number	16,700	17,500
Number of people served per water point	People	250	69
Total budget for water points	Million (US$)	119	146
Total budget for sanitation	Million (US$)	30	38
Budget for other costs (for example, O&M, capacity development)	Million (US$)	71	66
Total budget	**Million (US$)**	**220**	**250**

Sources: GRZ 2007, 2018a.
Note: NRWSSP = National Rural Water Supply and Sanitation Program; O&M = operations and maintenance.

implementation? and (d) What opportunities exist to enhance the effectiveness and outcomes of the programs?

To answer these questions, the study relied on the following methods: (a) systematic review of more than 50 sector documents, including but not limited to program documents, midterm and end-of-term evaluation of programs, and annual sector reports and (b) more than 30 key informant interviews and focus group discussions with central government ministries and agencies, district local governments, water utilities, sector development partners, and the private sector.

The study is limited to WSS services only and does not address broader water resource management challenges. In addition, the study does not address more general issues of water supply, sanitation, and hygiene and poverty, nor does it delve into the links of inadequate water supply, sanitation, and hygiene services with health and nutrition in the Zambian context. These issues have been examined extensively by others. This study has a narrower focus, which is to analyze the GRZ's flagship WSS programs and identify opportunities for enhancing their effectiveness and impact.

Structure of the Report

The rest of the report is organized as follows: Chapter 2 provides an analysis of the strategic relevance of the WSS programs to Zambia's economy, drawing on existing literature on the economic impacts of WSS and analysis of a sample of projects in both programs. **Chapter 3** analyzes the extent to which the programs are structured to deliver desired results, focusing on the design and prioritization of investments, implementation arrangements, and monitoring and evaluation. **Chapter 4** provides an analysis of the expenditure framework for both programs and the extent to which it supports efficient program implementation. **Chapter 5** summarizes opportunities that exist to enhance the effectiveness and impact of both programs and makes recommendations on medium-term actions to advance Zambia's WSS sector and narrow the gap between policy and practice.

Notes

1. Regional average is five staff per 1,000 connections, according to data from the International Utility Benchmarking Network for Water and Sanitation Utilities (www.ib-net.org).
2. Average tariffs for CUs in Zambia have consistently remained above average unit O&M since 2001 (see appendix A for details).

Chapter 2
What Is the Strategic Relevance of the Water Supply and Sanitation Programs to Zambia's Economy?

Zambia is going through tough economic times caused by macroeconomic imbalances and slow growth. Current high debt-service costs are crowding out poverty reduction spending on other vital sectors of the economy and further constraining economic growth. However, the long-term outlook suggests that investing in essential services, such as water and sanitation, is key to stimulating the economy.

Our findings confirm the strategic relevance of both the National Rural Water Supply and Sanitation Program (NRWSSP) and the National Urban Water Supply and Sanitation Program (NUWSSP) to Zambia's economy. The government of the Republic of Zambia (GRZ) has clearly articulated access to quality water and sanitation services as a priority issue for economic development and poverty reduction. The two national programs feature prominently in Zambia's 2030 vision, the Sixth National Development Plan (SNDP), and the Seventh National Development Plan (7NDP). 7NDP (2017-21) explicitly recognizes the economic and social case for improving water and sanitation and presents improved access to water supply and sanitation (WSS) as development outcome three under Enhancing Human Development pillar. Also, several strategy documents prepared by Zambia's development partners, including the World Bank's Country Partnership Framework (2018-23), identify inadequate WSS as a bottleneck to development. Conservative estimates suggest that Zambia loses US$194 million every year because of poor sanitation, a loss equivalent to 1.3 percent of the country's GDP (World Bank 2012).

Furthermore, analysis of a sample of projects from both the NRWSSP and the NUWSSP suggests that the economic rationale for both programs is sound. The analysis yielded a weighted economic rate of return (ERR) of 19.5 percent for the NRWSSPP and 21.5 percent for the NUWSSP (see tables 2.1 and 2.2). The measurable economic benefits of the projects include: (a) a number of new connections in the areas of intervention; (b) reduced distance traveled and filling times at the new connections and,

TABLE 2.1. Economic Rate of Return of Sampled Projects in the NRWSSP

Name of project	ERR (%)	Year approved	Million (US$)	Type of financing	Source of information
National Rural Water Supply and Sanitation Program, AfDB, NRWSSP	26.0	2006	22.35	Loan	Appraisal report
Transforming Rural Livelihoods in Western Zambia (NRWSSP Phase II), AfDB	22.0	2014	38.23	Loan	Appraisal report
Zambia Sanitation and Hygiene Program, UNICEF/DFID	12.0	2011	32.00	Grant	Program document
Weighted average, total	**19.5**		**92.58**		

Sources: AfDB 2006, 2014, 2015, 2016; American Institutes for Research 2019; CRIDF 2016; World Bank 2009, 2015.
Note: AfDB = African Development Bank; DFID = Department for International Development; ERR = economic rate of return; NRWSSP = National Rural Water Supply and Sanitation Program; UNICEF = United Nations Children's Fund.

TABLE 2.2. Economic Rate of Return of Sampled Projects in the NUWSSP

Name of project	ERR (%)	Year approved	Million (US$)	Type of financing	Source of information
Chirindu Water Supply and Sanitation Project, CRIDF-DFID	24.0	2016	8	Grant	Feasibility study
Integrated Small Towns Water and Sanitation Programme, AfDB	28.5	2016	120	Loan	Appraisal report
Lusaka Sanitation Program, AfDB	17.0	2015	50	Loan	Appraisal report
Lusaka Sanitation Project, World Bank	11.0	2015	65	IDA credit	Appraisal report
Water Sector Performance Improvement Project-AF, World Bank	27.0	2009	10	IDA credit	Appraisal report
Weighted average, total	**21.5**		**253**		

Note: AF = Additional Financing; AfDB = African Development Bank; CRIDF-DFID = Climate Resilient Infrastructure Development Facility-**Department for international development**. ERR = economic rate of return; NUWSSP = National Urban Water Supply and Sanitation Program.

therefore, higher time savings; and (c) health benefits from treatment costs saved and productive days gained. On-site sanitation offers opportunities for enhancing economic impact in urban areas. There are other nonquantifiable benefits from the projects, including increased hours of service, increased reliability, improved customer service, improved billing and collection systems, improved environmental conditions, and community mobilization.

Chapter 3
To What Extent Are the Flagship Water Supply and Sanitation Programs Designed, Organized, and Implemented to Efficiently Produce Results?

Program Design

The stated objectives of the National Rural Water Supply and Sanitation Program (NRWSSP) and the National Urban Water Supply and Sanitation Program (NUWSSP) are to increase access to safe and reliable water supply and sanitation services in rural and urban areas, respectively. The NRWSSP access targets for rural water supply were 75 percent by 2015 and 100 percent by 2030, and the targets for rural sanitation were 60 percent by 2015 and 90 percent by 2030. However, the first phase of the NRWSSP (2005-15) fell short of its ambitions, increasing rural water access only from 37 to 44 percent by 2015 and rural sanitation from 13 to 19 percent by 2015. The NUWSSP access targets for urban water supply were 80 percent by 2015 and 100 percent by 2030, and the targets for urban sanitation were 77 percent by 2015 and 90 percent by 2030. However, like the rural program, access to urban water supply has remained almost stagnant since 2011.

Our analysis shows that the two programs are not structured to efficiently deliver on the service outcomes that the government seeks. The three program documents (NRWSSP Phase I, NRWSSP Phase II, and NUWSSP) contain only strategies and funding targets, no operational plans. In other words, they provide an implementation framework for local authorities (LAs), commercial utilities (CUs), cooperating partners (CPs), and nongovernmental organizations (NGOs) to operate within and do not allow the program units in the Ministry of Water Development, Sanitation, and Environmental Protection (MWDSEP) much scope for driving and managing the programs. The program plans are general, as necessary, with the demand-driven approach and with implementation done by others. Although the activities in the two programs are adequate at a macro level to achieve the intended objectives, they suffer from a lack of operational detail as to how they will be implemented. Project-specific guidelines developed to assist implementation are often based on international norms or design standards (for example, 250 users per water point) and do not reflect surveys of actual practice in Zambia. Furthermore, the design does not consider changing and evolving externalities that may influence the sector and programs at large. For example, urbanization, population growth and patterns, climate change, and intersections with other sectors (for example, health and education) have effects on the required focus of the programs yet are given limited attention in program design. Cholera outbreaks are a common occurrence in Zambia, but there is no systematic use of such public health data to prioritize and target WSS investments to reduce cholera risks.

There is no program-level mechanism for prioritizing investments. The actual implementation plans are based on individual villages and CUs identifying their needs and wants and promoting their preferred scope of the project. In both cases, the decision makers (villages and CUs) have limited incentive to

consider value as most of the direct costs are paid by others (at least initial costs under loans in the case of the CUs). The CPs and NGOs also have their requirements, and there is a tendency for them to want to implement low-risk and cost-effective projects, which means that they prefer to fund projects in the more efficient CUs and districts and in areas that are not too remote or expensive. There is no dynamic national sector investment plan (SIP) that prioritizes investment across provinces and towns; no rolling investment plans in CUs that show what future investment needs will be and how best to meet them; and no holistic methods for planning and prioritizing infrastructure investment in CUs that considers asset conditions and the most cost-effective investments to improve the systems.

Although the type of program activities is generally adequate to achieve objectives, more emphasis remains on the creation of infrastructure rather than strengthening the capacity for service provision. For instance, although the first phase of NRWSSP exceeded its water point targets, coverage lagged as a result of fewer users per water point and the fact that at the end of the program period, more than 30 percent of the water points were not functioning. Similarly, the NUWSSP has driven considerable investment in increased water provision across the CUs; however, service coverage and quality have not changed much because most of the capital has gone into large bulk water production projects. Rehabilitation and expansion of aging water distribution networks, especially in small towns and peri-urban areas, have not received the same level of attention. Consequently, most of the increased production is lost in leaky networks, thus undermining the ability to expand coverage.

Sanitation has received limited capital investment in both rural and urban areas. The NRWSSP investments on rural sanitation are limited mainly to creating community awareness using voluntary community champions—a strategy that has proved ineffective in changing behavior (open defection has remained at 19 percent for the past 10 years).

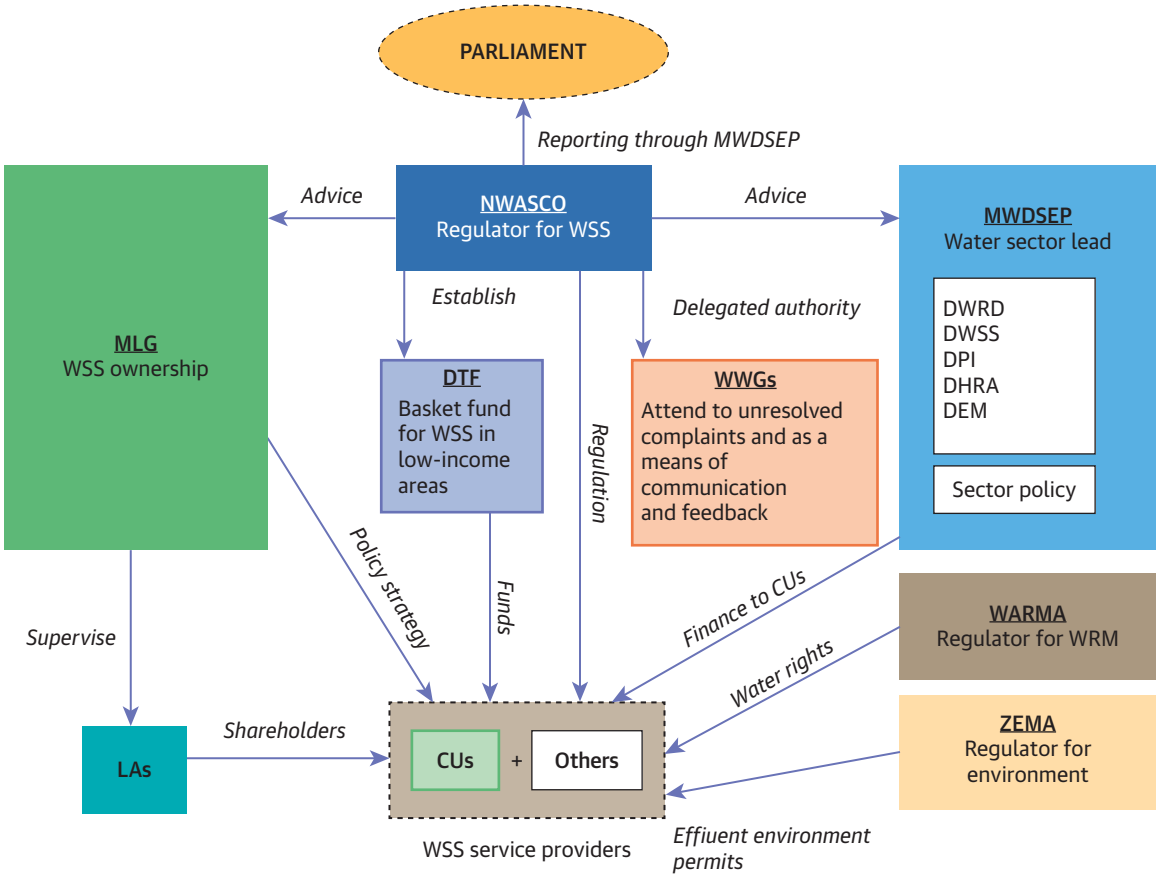
Institutional Arrangements

Implementation arrangements for both programs mirror the institutional setup of the sector, but accountability mechanisms are weak. Figure 3.1 illustrates the key sector institutions and their roles since 2016.[1] The MWDSEP is the lead agency in the sector with districts and CUs responsible for service delivery in rural and urban areas, respectively. The MWDSEP, through its Department of Water Supply and Sanitation (DWSS), is responsible for planning, implementing, and coordinating the national WSS programs (including policy, standards, and resource mobilization) and has created two separate units in its structure to coordinate the implementation of the NRWSSP and the NUWSSP.

The 11 CUs are responsible for providing water and sanitation in urban areas under a license granted by the regulator—the National Water Supply and Sanitation Council (NWASCO). The CUs' service areas generally align with a province, but this varies depending on the population density and development of each province. As per the Water Supply and Sanitation Act of 1997, local authorities in the service area are the main shareholders in the CU and are responsible for appointing the board of directors. However, in practice, the MWDSEP and its provincial representatives have an influence on the CUs, including the appointment of managing directors.

NWASCO collects performance information from each CU, publishes annual reports of comparative performance, and approves any proposed tariff increases put forward by CUs. A key focus in recent years

FIGURE 3.1. Institutional Framework for WSS Subsector



Source: Author.

Note: CU = commercial utilities; DEM = Department of Environmental Management; DHRA = Department of Human Resources and Administration; DPI = Department of Planning and Research; DTF = Devolution Trust Fund; DWRD = Department of Water Resources Development;
DWSS = Department of Water Supply and Sanitation; LAs = Local Authorities; MLG = Ministry of Local Government; MWDSEP = Ministry of Water Development, Sanitation, and Environmental Protection; NWASCO = National Water Supply and Sanitation Council; WARMA = Water Resources Management Authority; WRM = Water Resources Management; WSS = water supply and sanitation; WWGs = water watch groups; ZEMA = Zambia Environmental Management Agency.

is to promote the reduction of nonrevenue water, but this has had little effect in practice, and NWASCO seems to have scope for applying relatively limited incentives through imposing conditions on tariff increases. Tariffs approvals are to specific improvements (for example, make 1,000 new connections), not overall performance. NWASCO's annual reports' main power is in "naming and shaming" poor performers. NWASCO's regulatory mandate has recently been extended into rural areas and will be piloted shortly in three provinces (Central, Luapula, and Lusaka).

The roles and responsibilities for planning and implementing rural water supply and sanitation (RWSS) are well articulated in the NRWSSP program. However, capacity gaps at the district level are a significant constraint as more than 90 percent of WSS staff positions at the provincial and district levels remain vacant. Consequently, there is limited capacity at the local level for planning, implementation, and monitoring of program investments. Furthermore, the distribution of roles among districts, provinces, and the

TABLE 3.1. De Jure and de Facto Roles of Key Institutions in RWSS

Entity	De jure	De facto
National RWSS PSC	The PSC meets regularly to provide overall guidance in the planning and implementation of the sector. The committee is supported by the technical committee water sector advisory group and WSS subsector advisory group.	The PSC rarely meets because of daily pressures on the various PSs. The PS of the MWDSEP provides oversight.
PDWSS	Plans and coordinates implementation of districts and is the MWDSEP representative in provinces.	PDWSS had a minimal role but is being strengthened to a four-person team, though it appears little progress has been made in filling the new posts. At the provincial level, there are two relevant committees: P-WASHE and the PDCC, but these have a limited role in day-to-day implementation.
District council	The implementing agency for RWSS, which covers a district. It approves prioritization and spend and is ultimately the implementing agency for RWSS. There are two relevant committees at the provincial level: D-WASHE and DDCC.	This function is often carried out by a single person, the district WSS coordinator.
District RWSS unit	This unit manages implementation throughout the district.	The unit is meant to include two people, but in practice has one person—the district WSS coordinator—usually with shared transportation and laptop.
V-WASHE	At the village level, the V-WASHE committees are responsible for planning and O&M of WSS services. A village sanitation action group is accountable for monitoring and reporting.	V-WASHE committees are under resourced and reliant on community volunteers and champions.

Note: DDCC = District Development and Coordination Committee; D-WASHE = District Water, Sanitation, and Hygiene Education; MWDSEP = Ministry of Water, Sanitation, and Environmental Protection; O&M = operations and maintenance; PDCC = Provincial Development and Coordination Committee; PDWSS = Provincial Department of Water Supply and Sanitation; PS = permanent secretary; PSC = Program Steering Committee; P-WASHE = Provincial Water, Sanitation, and Hygiene Education; RWSS = rural water supply and sanitation; V-WASHE = Village Water, Sanitation, and Hygiene Education; WSS = water supply and sanitation.

MWDSEP remains unclear—a reflection of an incomplete devolution process. Some projects are planned and implemented by the MWDSEP directly (through the NRWSSP unit), others by districts. Table 3.1 shows the de jure and de facto roles for RWSS.

NUWSSP, on the other hand, is mostly driven by CUs. The role of the NUWSSP unit in the MWDSEP is limited to reporting progress of the development and implementation of individual projects by the CUs, with NWASCO monitoring operational performance of the CUs. However, neither the NUWSSP unit nor NWASCO drive prioritization across the urban sector.

NRWSSP Implementation

Rural water planning is instigated bottom-up by an organized community forming a Village Water, Sanitation, and Hygiene Education (V-WASHE) committee, which applies to the district for a new water system. The district RWSS unit conducts a desk appraisal to prioritize needs (there are always many more applicants

than the budget can cover) and then a field appraisal to check the situation in the field. The district council includes local leaders in the final decision regarding the annual list of projects for implementation within the yearly budget allocated centrally by the MWDESEP.

Rural water implementation and funding follows local government procedures. Once the district council approves the annual plan for new water supplies across the district, funds are released to start the procurement process for the contractors. Each district allocates projects, and the annual district budget covers contributions from both the government of the Republic of Zambia (GRZ) and CPs (except for the Japan International Cooperation Agency [JICA], the United Nations Children's Fund [UNICEF], and other NGOs who implement directly with their contractors). The NRWSSP guides new CPs into which districts they should focus or whether they should spread their inputs piecemeal over several districts to target the neediest villages. NGOs bypass the system and discuss needs and projects directly with districts (not villages). Implementation follows a standard process across the country irrespective of the CP providing funds (except JICA, UNICEF, and other NGOs). However, a CP may decide to fund only a particular type of water system in "their" districts, or just sanitation.

The resources at the district level are not adequate to carry out the functions that are devolved to the district level. The implementing agency for RWSS is the district council, which covers a district, and the water and sanitation function is often carried out by a single person, the district WSS coordinator. A typical district has about 150 to 200 water points, and the farthest may be more than 130 kilometers away from the office. The primary constraint is lack of equipment (for example, area pump menders) and funding for repairs of broken water points. A single person with part-time transportation and computer cannot adequately cover this role.

Rural water technologies are generally simple, low-cost technologies selected by the V-WASHE committee. The committee puts forward the technology that they want and believe they can maintain, then 10 people (five men, five women) are trained and must demonstrate a viable V-WASHE organization. The technologies used range from hand-dug wells with handpump; manually drilled wells with handpump; protected spring, possibly with distribution system; or borehole with handpump to piped systems based on any of the these, as appropriate (which usually means that there are too many people for a handpump and the V-WASHE committee can demonstrate that it can maintain a piped system).

Sanitation under the NRWSSP is mainly limited to promotion, sensitization, and hygiene awareness. Physical implementation is limited to toilets at schools and health centers, public toilets in markets, and so on. No financial support is provided to households for constructing latrines. The program, however, finances training of masons who can be hired by households to build toilets. The District Water, Sanitation, and Hygiene Education (D-WASHE) committee is responsible for sanitation and trains the V-WASHE committee. Demand for sanitation, however, varies greatly depending on local culture and attitudes to sanitation. Discussions on sanitation issues was culturally unacceptable, and it is only relatively recently that the GRZ has successfully made efforts to change, through implementation various methodologies, including community-led total sanitation (CLTS), school-led total sanitation (SLTS), and open defecation-free (ODF) campaigns.

Decision-making processes are clear, but there is a lack of oversight and accountability for program performance. Critical issues include the following:

- *High-level allocation of investment*. There is no prioritization mechanism for funding to provinces and districts.
- *Allocation of investment within provinces*. Allocation is driven by applications from villages, on a first-come-first-served basis, with some adjustment to take account of "fairness" and political considerations. There is little consideration of actual needs and value for money in the funding decisions.
- *Technology choice and water resources considerations.* Water resources are viewed as a design decision, rather than looking at water resources as a critical factor in where to implement new water systems. This links to the ability of the D-WASHE person to evaluate the water resource situation and the appropriateness of the technology option proposed by the village varies by district.
- *Procurement*. Procurement is slow, largely unplanned, and reactive. Districts have a low ceiling, equivalent to about US$10,000, which means most procurement activities require approvals at the provincial and central levels.
- *Accountabilities*. High-level accountabilities are clear, with the MWDSEP and the program office responsible for overall planning, funding, and monitoring of the program (including preparing quarterly reports), whereas districts are responsible for implementation. What is less clear is how these accountabilities are operationalized. There are no performance agreements between the MWDSEP and districts to date.
- *CP systems*. The planned approach is used for GRZ-funded water systems and CP-funded projects that follow the NRWSSP process. However, some CPs and most NGOs use their own, more project-based implementation approach.
- *Supervision and monitoring of construction.* Supervision is done by the district staff. Area pump menders are also trained for day-to-day supervision. The study found conflicting reports on the quality of construction, with some agencies (such as the Water Resources Management Authority) reporting poor borehole construction. However, some funding agencies (African Development Bank) said that they were generally happy with the quality of work.

The rural approach to operations and maintenance (O&M) is generally sound in theory; however, the success of the approach and the constraints in practice are not well documented. The MWDSEP has produced handbooks and manuals for O&M of handpumps using the sustainable operations and maintenance project (SOMAP) approach. These are based on the well-tested approach of appointing a caretaker to look after the wellhead and handpump and the V-WASHE committee to raise funds for O&M and establish district-level spare parts shops. The guidelines are rather general and lack practical details of how to raise funding and how the district shops will operate. There are no data to date on how well this system works in practice or on the effectiveness of O&M in general. Basic information, such as percent of operational handpumps, is missing. However, the O&M guidelines state that 77 percent of

handpumps were functioning in 1995 compared with the 70 percent estimated to be operating now, which suggests that the current approach is not working. The district shops are not commercially viable without a subsidy (which is recognized in the guidelines), but the sustainability of the subsidy and how this is organized in practice is not clear. Furthermore, there are no guidelines for the O&M of small piped systems nor a clear policy of how such systems should be managed in the future.

The underlying incentives in the rural program are to deliver infrastructure rather than services—that is, to create physical facilities rather than increase coverage and ensure high service levels. By nature, the culture in the sector implementing organizations tends to be bureaucratic/political rather than commercial. The incentives for the various stakeholders are summarized here:

- *Villages*. Strong incentives to seek funding for their projects and to seek technologies/solutions with high levels of service because they are not making any significant contribution to the implementation costs.
- *Districts and provinces*. Strong incentive to be seen implementing projects and demonstrating improved coverage (this seems to be the main driver for the program), and there are limited incentives for long-term sustainability and O&M. However, the district staff report to the local authorities, not to the MWDSEP, and there is no obvious incentive for districts to report monitoring and evaluation (M&E) information to the province or the MWDSEP.
- *National program office and ministries*. As with districts and provinces, the main incentive is to demonstrate improved coverage (that is, building as many new systems as possible).
- *CPs and NGOs*. The incentive is to deliver efficient projects that achieve the intended objectives. Different organizations will have different priorities, but there is an incentive to implement "safe" projects in active provinces and low-cost provinces (for example, with good transport links).
- *Private sector*. The private sector involvement in the rural program is limited to small contractors and individuals (for example, area pump menders) because procurement packages are small, and the rules drive procurement and compliance, with procedures taking precedence over value for money or quality of work.

NUWSSP Implementation

Implementation of the urban program is on a project-by-project basis and is left entirely to individual CUs and the funding agency. However, most CU staff are inexperienced in managing large projects, and there are reports of delays and cost overruns. However, because of the lack of monitoring information, no data are available on project outturn costs compared with contract values.

Implementation capacity varies across CUs. The larger ones are generally able to manage and deliver large projects, whereas the smaller ones struggle to manage projects as a result of inadequate resources and inability to attract talent. Most of the larger CUs have established dedicated infrastructure directorates to plan and implement projects. However, the focus tends to be on developing projects and seeking funding. Less emphasis is placed on long-term asset management and optimizing investment (for example, reduction of nonrevenue water [NRW]) or on managing ongoing projects.

The overall resources within the CUs to plan and deliver projects are adequate, but broader skills are needed to move toward a more strategic approach to project planning and implementation. The resources within CUs vary significantly by the size of the CU, ranging from more than 900 staff in Lusaka to about 80 in Luapula (NWASCO 2017). However, a simple comparison of the actual amount invested in projects against staff numbers suggests that size is not the sole consideration.

The NUWSSP investment mix is heavily skewed toward bulk water supplies. A major issue is that implementation has focused substantially on new water resource development. Rehabilitation and expansion of aging water distribution networks, especially in small towns and periurban areas, has not received the same level of attention. Consequently, most of the increased production is lost in leaky networks, thus undermining the ability to expand coverage. Although the NUWSSP is on target to deliver the planned capital expenditure, the urban water supply coverage has not increased at all since the program was conceived in 2011.

Asset maintenance in CUs is reactive. Most CUs struggle to keep services running and, at the same time, expand service areas, which often leads to long-term maintenance being deferred. The 2017 NWASCO report has several tables showing O&M performance. One indicator is the percentage utilization of water and sewer plants—that is, the percent of the design capacity that is used—and low figures suggest a maintenance problem. The utilization figures show that about half of the plants operated at less than 50 percent capacity. The second indicator is the volume of planned maintenance work compared with unplanned—again, a low figure indicates maintenance problems. The planned versus unplanned maintenance figures show that three CUs had high levels of unplanned work.

A major issue in the urban sector is how to improve nonpiped services—in particular, water and sanitation to periurban areas and nonpiped sanitation in all urban areas. Up to now, the CUs have avoided this issue by focusing on improving bulk water supply, but with increasing urban populations and upgraded bulk water supplies, nonpiped services are becoming a critical issue. There is no agreed-upon national policy or guideline on how best to implement nonpiped services, though NWASCO has prepared strategies and various models have been used by different CUs with an implied assumption that the main urban areas will all eventually have piped sanitation, despite the very high investment and operational costs. In periurban areas, the primary approach by CUs is the traditional approach of selling water at kiosks and promoting sanitation through community sensitization with little or no investment of financial support to households. Lusaka has experimented with water trusts, which are a form of community-managed systems; other models used in regional countries are fecal sludge management (FSM) for nonpiped sanitation in Uganda, ablution blocks in the large Nairobi slums in Kenya, and prepaid automated water vending machines in both Kenya and Uganda.

The incentive environment for the urban program is commercially oriented and influenced by an effective regulatory environment. As "commercial" utilities, the CUs have a more business-related culture than the rural implementing agencies and are generally good at getting funding and developing projects. However, the perceived incentive within CUs is to increase bulk water supply to the main urban areas in the larger cities rather than to reduce NRW, to supply water to small towns and peri-urban areas, or to

improve sanitation, all of which are perceived as "difficult" projects with higher overheads, lower visibility, and higher risks. The incentives of the CUs and CPs are well aligned, as most CPs also want to deliver safe projects with clear and easily measured outputs.

Program Monitoring

M&E are generally weak in both programs (especially the rural program), and there are no mechanisms to hold districts and CUs accountable for performance. At the sector level, M&E is done by annual joint sector reviews, but these suffer from delays (done every three to four years instead of annually) and lack of basic data. The NRWSSP's information management system has undergone several rounds of development but is still not able to provide reliable data. The challenges as identified are: (a) the M&E framework is overall complex and trying to measure too much and (b) overreliance on complex databases and information technology systems. The MWSDEP is exploring the possibility of using a District Health Information System (DHIS**)**, which would be managed by the Ministry of Health and use community champions. What is collected on water is very basic and aimed at ongoing monitoring of water supply provision/operation rather than project implementation.

There is relatively good data on CU performance by NWASCO, but significant gaps exist in both geographical coverage and project monitoring. NWASCO has a time-proven management information system (IMS) that caters to the CUs and private systems and that has also been extended to cover on-site sanitation. However, NWASCO's monitoring is mainly regulatory and operational and does not provide information on the current and planned infrastructure development and expenditure under the NUWSSP. Other issues with the NWASCO system include difficulty in querying the database to generate essential management information and lack of consistency between NWASCO indicators and service levels as defined by the NUWSSP.

Note

1. Prior to 2016, the WSS subsector was under the Ministry of Local Government and Housing (MLGH).

Chapter 4
Does the Existing Sector Expenditure Framework Support Efficient Program Implementation?

Budget Structures and Expenditures in the WSS Subsector

The allocation to the sector and its programs shows a declining pattern, with close to 80 percent of the sector being financed by cooperating partners (CPs), falling from more than US$140 million per year under the Sixth National Development Plan (SNDP) to US$80 million per year under the Seventh National Development Plan (7NDP) (tables 4.1 and 4.2). The budget allocation under 7NDP was reclassified under four strategic areas of intervention: (a) enhanced delivery of safe water supply and sanitation services; (b) improved availability of water supply and sanitation infrastructure; (c) improved research and development; and (d) promotion of alternative finance (basket funding and public-private partnerships (PPPs).

Moreover, the planned budget allocations are well below the estimated cost estimates for the rural and urban programs. Comparing the budget allocations in the SNDP and 7NDP (tables 4.1 and 4.2) with the program cost estimates (tables 4.3 and 4.4), it is clear this is true for both the National Rural Water Supply and Sanitation Program (NRWSSP) and the National Urban Water Supply and Sanitation Program (NUWSSP). Also note that in the 7NDP (2016-21), the five-year budget allocation for the water supply and sanitation (WSS) sector (US$399 million in table 4.2) is less than half of the NUWSSP's development cost estimate alone (US$920 million in table 4.4) for a similar five-year period (2016-20).

Worse still, the allocation the Ministry of Finance (MoF) approved to the sector is lower than the budget allocated in the national development plans (NDPs). Table 4.5 shows the Ministry of Finance yearly budget allocations to the WSS sector from 2009 to 2018. Those to the WSS sector show significant variability relative to the total national budget, as well as in absolute terms—that is, a drastic fall in 2012 (from 2.7 to 0.6 percent), strong recovery in 2013 (from 0.6 to 2.4 percent), and a declining trend from 2013 to 2018. The subsector budget allocation in table 4.5 is based on annual budget lines of program and projects included in the MoF yearly budgets. The NRWSSP has a budget line in the annual budgets, and in parallel, there are other rural water supply and sanitation (RWSS) projects. The figures in table 4.5 include both. It is similar for the NUWSSP.

There is a declining trend of MoF budget allocation to the WSS sector from 2013-18. A similar pattern is seen in the NDPs' budget allocations, beginning with the year 2014. Figure 4.1 shows budget allocations to WSS sectors by both the NDPs and the MoF for their overlapping period from 2011-18.

The declining trend in budget allocation could be the result of the WSS sector being the recipient of grant funding that does not go through the national budget. For example, the Millennium Challenge Compact provided US$355 million[1] in financing to LWSC between 2013 and 2017. Similarly, the RWSS sector received significant off-budget funding from bilateral organizations through international nongovernmental organizations (NGOs)—for example, the Department for International Development (DFID)

TABLE 4.1. Budget Allocations, Sixth National Development Plan (US$ million)

	2011	2012	2013	2014	2015	2016	Total	Average/year
NRWSSP	10	12	14	26	24	12	98	-
NUWSSP	15	18	141	257	230	121	782	-
Total	**25**	**29**	**156**	**283**	**254**	**133**	**880**	**147**
Planned funding								
Cooperating partners CPs	-	-	108	242	216	105	670	112
Government of Zambia GRZ	25	29	48	40	38	28	209	35

Sources: GRZ 2011b, 2013b.
Note: CPs = cooperating partners; GRZ = government of the Republic of Zambia; NRWSSP = National Rural Water Supply and Sanitation Program; NUWSSP = National Urban Water Supply and Sanitation Program.

TABLE 4.2. Budget Allocations, Seventh National Development Plan (US$ million)

Strategies	2017	2018	2019	2020	2021	Total	Average/year
1. Enhanced provision of safe WSS services	41	65	53	63	73	294	-
2. Improved availability of WSS infrastructure	11	17	29	26	9	93	-
3. Enhanced R&D in WSS	0	0	0	0	0	1	-
4. Promote alternative finance	2	5	5	0	0	11	-
Basket funding	2	5	5	0	0	11	-
PPPs	0	0	0	0	0	0	-
Total	**54**	**87**	**87**	**89**	**82**	**399**	**80**
Planned funding							
Cooperating partners CPs	46	73	72	77	70	338	68
Government of Zambia GRZ	8	14	14	12	12	61	12

Source: GRZ 2018b.
Note: CPs = cooperating partners; GRZ = government of the Republic of Zambia; PPPs = public private partnerships; R&D = research and development; WSS = water supply and sanitation.

TABLE 4.3. NRWSSP Cost Estimates (US$ million)

	2016	2017	2018	2019	2020	2016-20	2021-30	2016-30
Rural water supply	21	27	28	25	28	129	501	631
Rural sanitation	21	26	26	24	26	124	450	574
O&M, planning, monitoring and reporting	3	5	7	8	8	31	135	166
Capital, equipment, and 5% contingency	2	29	3	3	8	45	125	171
Grand total	**47**	**88**	**64**	**60**	**70**	**330**	**1,212**	**1,542**

Source: MLGH 2015.
Note: O&M = operations and maintenance.

TABLE 4.4. NUWSSP Cost Estimates (US$ million)

	2011	2012	2013	2014	2015	2011-15	2016-20	2021-30	2011-30
Urban water supply	161	204	245	244	216	1,070	732	1,508	3,310
Replacement infrastructure	88	109	135	151	148	631	444	576	1,651
Urban sanitation	26	31	37	39	39	172	159	309	640
Replacement infrastructure	13	16	20	25	28	102	100	93	295
Other related development costs	6	8	5	5	8	32	29	70	131
WSS development costs	193	243	287	288	263	1,274	920	1,887	4,081
O and M costs	82	89	95	101	106	472	1,676	2,742	4,890
Total development plus O and M costs	275	332	382	389	369	1,746	2,596	4,629	8,971

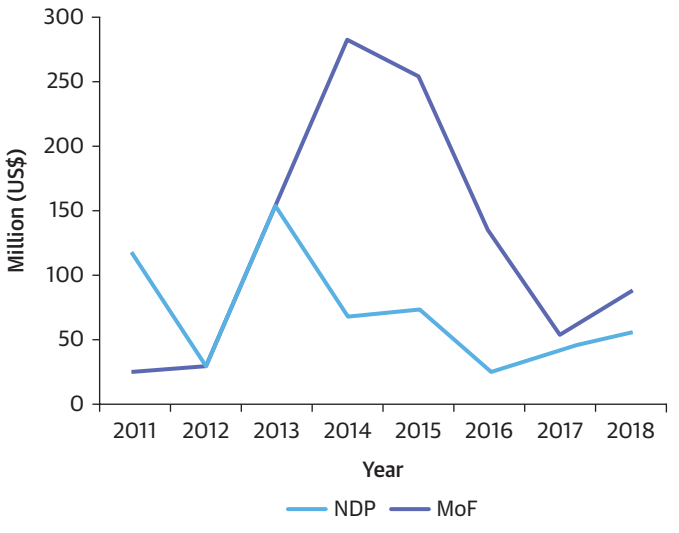
Source: GRZ 2011a.
Note: O&M = operations and maintenance; WSS = water supply and sanitation.

TABLE 4.5. Ministry of Finance Yearly Budget Allocation to the WSS Sector (US$ million)

	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	Total
WSS sector	45	93	116	29	151	68	73	27	43	55	699
Rural WSS	7	24	38	6	16	28	26	12	26	3	185
Urban WSS	38	69	79	23	135	40	46	15	17	52	514
WSS sector of total budget (%)	1.4	2.6	2.7	0.6	2.4	0.9	1.2	0.5	0.6	0.7	-

Sources: GRZ, Ministry of Finance, Budget Office, years 2009 to 2018—Text of the Annual Budget Speeches; Ministry of Finance, Budget Office, years 2009, 2010, 2011, 2016, 2017, 2019—Activity-based Annual Budgets (Yellow books).
Note: WSS = water supply and sanitation.

FIGURE 4.1. NDP and MoF Budgets for the WSS Sector



Source:
Note: This figure presents data from Table 4.1, 4.2 and 4.10. MoF = Ministry of Finance; NDP = national development plan.

channeled US$32 million off-budget, with the United Nations Children's Fund (UNICEF) as the implementing agency during 2011-16 (American Institutes for Research 2019), and WaterAid reports channeling about US$1.5 million per year for WSS projects in rural areas (WaterAid 2015).

WSS Sector Budget Execution

Sector budget execution was poor, varying from 40 to 66 percent from 2012-16. Budget execution effectiveness (ratio of the budget spent over authorized budget allocation) in the WSS sector, tracked for years with available financial reports issued by the MoF Public Financial Management Office (see table 4.6), has been poor, as follows:

- Year 2012 budget approved US$29 million compared with the actual expenditure of US$19 million (66 percent)
- Year 2013 budget approved US$151 million compared with the actual expenditure of US$60 million (40 percent)
- Year 2014 budget approved was US$68 million compared with the actual expenditure of US$36 million (52 percent)
- Year 2016 budget approved was US$47 million compared with the actual expenditure of US$23 million (60 percent)

The large and persistent deviations between budget authorized and actual expenditure is indicative of weaknesses in the government's ability to implement the programs.

Procurement is a major issue behind low budget execution rates. Poor budget execution effectiveness has been related to weak procurement capacity in the WSS sector, including delays in approval and adoption of protocols in the project or program implementation manuals; operational plans; procurement plans, which result in delays in procurement of consultancies; goods; and civil works for the implementation of project activities. Procurement management is rated C+ and expenditure arrears D+

TABLE 4.6. Budget Authorized Compared with Actual Expenditure (US$ million)

		Budget Allocated	Supplementary allocation	Total Budget Authorized	Actual Expenditure	AE/TBA (%)
Year 2012	Infrastructure services	60	-	60	37	62
	WSS	29	-	29	19	66
Year 2013	Infrastructure services	173	-	173	74	43
	WSS	151	-	151	60	40
Year 2014	Infrastructure services	83	-	83	57	68
	WSS	68	-	68	36	52
Year 2016	Infrastructure services	32	21	53	32	60
	WSS	27	21	47	23	49

Sources: GRZ, Ministry of Finance, 2012—Financial Management Report; Ministry of Finance, years 2013, 2014, and 2016—Ministerial Statement on the Financial Report for the years ended on December 31, 2013, 2014, and 2016, respectively.
Note: AE = actual expenditure; TBA = total budget authorized; WSS = water supply and sanitation.

in the Public Expenditure and Financial Accountability report (2017).[2] Financial management capacity of implementing agencies (most of them commercial utilities [CUs]) and project management units has also been cited as a reason for delays and underperformance (IEG 2016).

Overall, medium-term and annual budget frameworks provide a good basis for prioritization of expenditures and expenditure implementation. However, WSS sector historical budget allocations in both the NDPs and the MoF were low compared with both NRWSSP and NUWSSP estimated costs. At the same time, MoF allocations were almost always lower than those in the NDPs. Worse still, spending on MoF annual allocated funds has been poor.

Financing of the MoF budget for both the NRWSSP and the NUWSSP has been dominated by CPs (loans and budget support grants). About 75 percent of CPs financing is development loans to the government of the Republic of Zambia (GRZ). CPs grants are mostly directed to RWSS.

Sector financing off-budget has been significant for both the NRWSSP and NUWSSP but is not accounted for by MoF budgets. About US$90 million was spent off-budget for the RWSS sector during 2006-15 and about US$355 million in the urban WSS sector over the past five years.

Program Funding Adequacy and Predictability

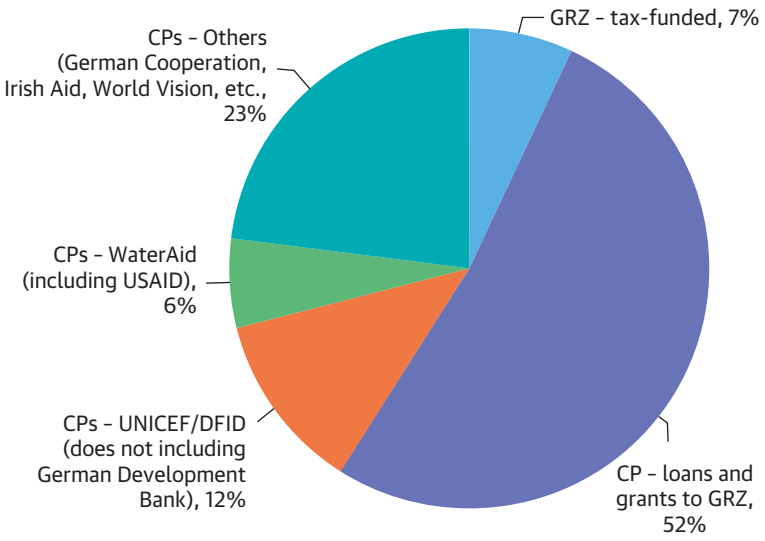
The SNDP allocated significant funding space (US$880 million) for the WSS sector for 2011-16, but actual annual budget allocations by the MoF was US$464 million, and actual expenditure is estimated to be about US$320 million. Subsequently, the 7NDP provided a limited funding space for the WSS sector (US$399 million), proposing at the same time to look for alternative forms of financing through basket funding and PPPs.

Off-budget financing, which accounted for a little less than half of the total funding, ensured that the NRWSSP Phase I funding level surpassed target levels but was a factor in unpredictability. Historical funding of the NRWSSP exceeded expectations; that is, NRWSSP Phase I was expected to receive US$220 million from 2006-15, but it managed to fund projects for a total of US$270 million, 23 percent higher than planned. Funding was mostly from CP loans and grants to fund projects (on-budget) and CP grants implemented by international NGOs (off-budget). GRZ contributed with cash tax-funded that amounted to 7 percent of total funds and with cash provided by loans from CPs (see figure 4.2). Off-budget funding was about US$110 million, with major contributors including UNICEF/DFID at US$32 million for 32 districts and WaterAid at US$15 million.

Compared with its cost estimates, NRWSSP Phase II has limited funding predictability. It proposes to fund RWSS projects for US$330 million from 2016-20, or about US$66 million per year, which is equivalent to 70 percent of the US$450 million total budget allocated to the WSS sector by the NDP. However, from 2016-18, total budgeted funds for the RWSS sector has been about US$41 million (see table 4.7), or an average of about US$14 million per year, well below the US$66 million per year. For 2021-30, the program proposes US$1,212 million (table 4.5), equivalent to an average of about US$120 million per year. Raising the funding needed will be a formidable challenge.

One of the significant on-budget funders of the NRWSSP is the African Development Bank (AfDB), which cofunds along with the OPEC Fund for International Development, a project of about US$38 million. The GRZ provides about 10 percent of funds for this project. In addition to this, two other significant CPs

FIGURE 4.2. Funding Sources for NRWSSP 2006–15



Source: Data from Table 4.7
Note: CPs = cooperating partners; DFID = Department for International Development; GRZ = government of the Republic of Zambia; NRWSSP = National Rural Water Supply and Sanitation Program; UNICEF = United Nations Children's Fund.

TABLE 4.7. NRWSSP Phase II: Costs, NDP, and MoF Budget Allocations (US$ million)

	2016	2017	2018	2019	2020	2016-20	2021-30
NRWSSP investment cost	47	88	64	60	70	330	1,212
NDP budget allocations to WSS	133	54	87	87	89	450	-
MoF annual budget allocations to WSS	27	43	55	-	-	-	-
Rural WSS	12	26	3	-	-	-	-

Source: GRZ, Ministry of Finance, Budget Office, years 2016, 2017, and 2018—Activity-based Annual Budgets (Yellow books).
Note: MoF = Ministry of Finance; NDP = national development plan; NRWSSP = National Rural Water Supply and Sanitation Program; WSS = water supply and sanitation.

have signaled potential off-budget funding to the NRWSSP from 2016-20—that is, UNICEF (US$47 million) (UNICEF 2015) and WaterAid (US$23 million) (WaterAid 2015). Based on this information, funding availability for the period 2016-20 is about US$133 million and covers about two-fifths of what the NRWSSP has proposed for 2016-20 (see table 4.8). No funding has been identified for 2021-30. Under these circumstances, unless new funding sources are identified, funding predictability of the NRWSS is threatened.[3]

The NUWSSP, on the other hand, has significant funding predictability. Most funding is based on well-appraised infrastructure projects and loan/grant agreements signed by donors and the MoF/GRZ. Based on information collected from the Ministry of Water Development, Sanitation, and Environmental Protection (MWDSEP), financing available for urban WSS sector projects over 2013-18 was about US$925 million (table 4.9), whereas total signed commitments from all CPs and the GRZ for 2013-30 was about US$2,734 million (table 4.10). Compared with the total cost of the NUWSSP of US$4,081 million for

TABLE 4.8. NRWSSP Finance Available (US$ million)

	2006-15	2016-20	2021-30
On-budget	160	53	-
GRZ: Tax funded	20	15	-
GRZ: Loans/credits and grants from CPs	140	38	-
Off-budget	110	80	-
UNICEF/DFID	32	47	-
WaterAid (USAID, DFID, etc.)	15	23	-
Others (Derman cooperation, IrishAid, WorldVision etc.	63	10	-
Total	**270**	**133**	**-**

Sources: GRZ, Ministry of Finance, Budget Office, various years—Activity-based Annual Budgets (Yellow Books); Oxford Policy Management 2015; UNICEF 2015; and WaterAid 2015.
Note: CPs = cooperating partners; DFID = Department for International Development; GRZ = government of the Republic of Zambia; NRWSSP = National Rural Water Supply and Sanitation Program; UNICEF = United Nations Children's Fund; WSS = water supply and sanitation.

TABLE 4.9. Finance Available for NUWSSP Projects (US$ million)

	2013	2014	2015	2016	2017	2018	2013-18	2013-30
Urban WSS, project-based available	37	100	73	120	275	320	925	2,734

Source: GRZ, Ministry of Water Development, Sanitation, and Environmental Protection, 2018,"Quarter Three Report and Consultants Preliminary Estimates Based on Active Project Approved by Various Donors."
Note: NUWSSP = National Urban Water Supply and Sanitation Program; WSS = water supply and sanitation.

TABLE 4.10. Planned and Actual Urban WSS Investment

CU	Planned (US$ million)	Actual (US$ million)	Act/plan (%)	Revenue (O&M, %)	Pop (US$ million)	Planned (US$/head)
Chambeshi	165	133	81	82	0.353	467
Eastern	125	4	3	88	0.311	402
Kafubu	609	553	91	112	0.711	857
Luapula	64	211	330	49	0.215	298
Lukanga	218	9	4	82	0.432	505
Lusaka	1,264	1,278	101	122	2.396	528
Mulonga	581	181	31	109	0.52	1,117
Nkana	618	263	43	97	0.795	777
North-Western	62	46	75	88	0.271	229
Southern	241	18	7	107	0.476	506
Western	133	38	29	69	0.216	616
Total	**4,080**	**2,734**	**67**	**105**	**6.696**	**609**

Sources: GRZ, 2018; Ministry of Finance, 2012—Financial Management Report; Ministry of Finance, years 2013, 2014, and 2016—Ministerial Statement on the Financial Report for the years ended on December 31, 2013, 2014, and 2016, respectively; NWASC) 2017.

2011-30, the funding available represents 67 percent; thus, the urban WSS sector needs to raise about 33 percent of what it needs, equivalent to roughly US$1,300 million over the next decade. Based on its track record, raising about $1 billion for new projects in the urban water sector might be feasible once CUs address inefficiencies and confidence is built to allow them to access capital markets and attract government and donor finance.

Adherence of Budgeted Program Expenditures to Government Priorities

For the NUWSSP, capital expenditure outputs are in line with budget allocations, but service outcomes are not in line with plans, mainly because of low nonrevenue water (NRW) and infrastructure maintenance. Most projects in the urban WSS sector, financed by bilateral and multilateral agencies, are implemented by project management units specially staffed to deliver the intended results. Upon completion, funding agencies prepare an implementation completion report that includes a comparison of budgets allocated to finance intended outcomes with budgets executed and actual results. The consultants did verify one such report for a project implemented by Lusaka Water and Sanitation Company (LWSC) (IEG/World Bank 2016), and if the average implementing agency performs as well as then LWSC, then in general, budgetary allocations are consistent with intended results. However, results are severely affected by implementation delays as a result of limited procurement and financial management capacity.

For the NRWSSP, the outputs but not the coverage outcomes were reasonably in line with budget allocations. Assessments of the relationship between budgets allocated to the NRWSSP and intended results were done by a midterm review (MTR) team in January 2013, by the General Auditor in September 2014,[4] and by the end-of-term evaluation (ETE) team. According to the MTR team, by 2013, the information management system—vital to report on achievements—was, and still is, not fully operational. However, the MTR team suggested that about 6,000 water points were built during 2007-12. With this estimate, they concluded that out of US$150 million, a significant amount of financial resources was allocated to general management and sanitation (about US$90 million).[5]

The Efficiency of Program Expenditures

The per-unit costs of the NUWSSP are reasonable. The NUWSSP cost per new connection is US$3,179 to achieve full access to water and sanitation services by the year 2030. Assuming each connection has five people, the per capita cost of the NUWSSP would be about US$636. The World Health Organization (WHO) reference suggests US$164 per connection. However, this appears too low for urban piped systems and does not take into account local circumstances. Based on similar projects in the region, we expect a minimum of US$294 per capita if building on existing infrastructure and minimal sanitation element to more than US$735 per capita for a completely new system including piped sanitation. Thus, the US$636 per capita cost of the NUWSSP is considered reasonable.

Based on ongoing projects, though NUWSSP investment costs are reasonable, efficiency is rated modest. In general, when the implementation of urban projects takes longer than expected, and they show frequent cost overruns, the efficiency of project expenditure is low; when at least one of the two issues happens—time overrun or cost overrun—efficiency is rated modest; when none of the two issues

happen, efficiency is rated high. Expenditure efficiency is modest, as shown in table 4.10. One example of such a rating is given by the IEG/World Bank to the Water Sector Improvement Project, which closed on June 30, 2013, 36 months after its expected closing date of June 30, 2010.

For NRWSSP, the per capita unit cost is in the high range—US$173 per person by the year 2030. With this unit cost, a rural water supply system for about 200 people would cost about US$40,000, compared with US$10,000 suggested in the MTR for NRWSSP Phase I. International references provided by the WHO (2012)[6] suggest per capita investment cost of US$37 in the case of boreholes, US$34 in the case of dug wells, and US$79 in the case of rainwater systems.

NRWSSP Phase I efficiency is rated modest. The consulting team preparing this report did not undertake an independent assessment of efficiency and, therefore, cites the findings of the MTR (GRZ 2013a) and the ETE teams about the NRWSSP delivery efficiency: "The Program was effective in mobilizing resources and producing some outputs, such as water points. However, it was not as effective in deploying those outputs optimally relative to the achievement of its objectives." Efficiency is difficult to assess because of inadequate reporting on inputs (costs) and outputs, which is further compounded by sometimes conflicting reports on such critical issues as WSS coverage from different—and sometimes the same—sources. One cannot assess efficiency solely based on this, as suggested by both the MTR and the ETE teams. The program was expected to deliver access to not only water services but also sanitation, capacity building, consolidation of decentralization, and so on. However, if, as suggested by the MTR team, only US$60 million was allocated to tangible outputs (water systems) and US$90 million to nontangible outputs, the efficiency is rated modest.

Analysis for Fiscal Impact of the Programs

The fiscal requirements for both WSS programs are considerable. For RWSS ongoing projects, based on the analysis of program expenditures, the GRZ will need to allocate about 15 percent of the cost of the program yearly—about US$15 million per year for a US$500 million program for 2021-30. For loans to finance urban WSS, the GRZ will need fiscal space for the integrity of the loans, though CUs take responsibility for repaying a significant portion (guaranteed by the GRZ). As the cost of the NUWSSP is significant (US$4,080 million), the space needed to finance the program through loans would be large compared with the current fiscal situation of the GRZ.

Moreover, our analysis shows that Zambia's chronically inefficient water utilities are creating a fiscal burden and making it harder for the government to finance the sector. During 2001-17, Zambia's CUs lost an estimated US$858 million from high levels of NRW and low bill collection efficiency (see appendix A for details). Most of the losses (US$554 million) occurred during 2011-17 and was equivalent to about 20 percent of the total capital so far invested in the NUWSSP. From a public finance perspective, the inefficiencies have resulted in hidden costs or unintentional implicit subsidies to the CUs that can be considered an illegitimate claim on public resources. Unlike direct subsidies, which are formally allocated and recorded on the utilities' books, hidden costs are accumulated by utilities yet go unrecorded, thereby creating a fiscal burden on the government. There is evidence that CUs are compensating by reducing investment in maintaining their assets. They also delay or forgo essential maintenance and repairs—actions that trigger a downward spiral of significant

TABLE 4.11. Stock of Public and Publicly Guaranteed Debt (US$ billion)

	2013	2014	2015	2016	2017	2018
Public and publicly guaranteed	7.4	9.4	10.4	13.2	16.3	18.3
Commercial	0.8	1.8	3.2	3.2	4.3	5.1
Public debt to GDP (%)	27	36	62	61	66	78

Source: IMF 2019.
Note: GDP = gross domestic product.

deterioration in assets, declining service quality and increasing cost for each unit of service provided. When this happens, losses increase substantially, and more investment is required to carry out repairs. This vicious cycle, which begins with hidden costs and proceeds to asset deterioration, means that when the government finally absorbs the costs, it does so only by adding to the national debt or reducing funding for other programs.

Funding of the NRWSSP and NUWSSP will impose significant challenges to the limited fiscal space of the GRZ. Although both programs together need funding well above 1 percent of gross domestic product (GDP) per year to compensate for recent low spending[2] and to finance new investments, the GRZ will restrain fiscal expenditure to deal with the prevailing public debt situation. Public debt has risen from $7.4 billion in 2013 to $18.3 billion in 2018, taking Zambia's public debt-to-GDP ratio from 27 to 78 percent, reducing fiscal space drastically (table 4.11). The GRZ's actions to confront this unsustainable debt situation include the halting of expensive commercial debt (at US$5.1 billion as of 2019) and improving the effectiveness of new concessional debt. In this context, a credible financing strategy for the NRWSSP and the NUWSSP must contribute to the creation of new fiscal space.

From the earlier analysis, it is clear that the GRZ has minimal fiscal space for new loans, including concessional loans. Therefore, a financing strategy for both programs must contribute to the creation of fiscal space, which could be achieved in two ways. Second, NRWSSP financing could be fully funded by donor grants, though this assumes that donor grants are available. For the NUWSSP, concessional financing could include carefully conceived conditions to overhaul the operational and financial performance of CUs to make them able to leverage the concessional financing. For example, for each dollar received by CUs as concessional financing, they should undertake operational and financial turnaround actions to be able to contribute to the funding of investments with their own contributions plus loans (nonguaranteed by the GRZ) based on their cash flows. If the conditions of concessional financing are well designed and relevant agreements (policies and laws) with government authorities are obtained to improve operational performance of the CUs—for example, as part of a Program-for-Results operation—it is estimated that CUs as whole could increase their revenues to US$88 million per year (0.4 percent of the GDP) by reducing NRW to 25 percent and improving collection efficiency to more than 90 percent (see appendix A for details). This means the remaining NUWSSP capital could be financed by two concessional financing operations of US$205 million each over the next 10 years, plus funding based on the cash flows of the CUs (US$880 million).

Notes

1. USA Department of State, Millennium Challenge Compact between United States of America and Zambia, signed in Lusaka on May 10, 2012.
2. PEFA Assessment Report 2017 also states endemic under spending in some spending agencies in Zambia, WSS is one.
3. The MTR of the NRWSSP undertaken in January 2013 indicates that in 2010, a public expenditure review of the subsector was undertaken and another, with a specific focus on resource allocations and financial flows in the water sector, in 2012. Both documents were taken into account when preparing this report.
4. General audit report as analyzed by the Committee on Local Governance, Housing and Chiefs' Affairs on the Report of the Auditor General on the Water and Sanitation Program Support Phase I.
5. According to their estimates, each water point should not cost more than US$10,000, taking altogether about US$60 million. Then NRWSSP has resulted in intended results, subject to the qualifications suggested by the MTR team.
6. The investment costs suggested by the WHO do not include project management costs. Also, costs to be corrected by an inflation factor of 1.17—that is, multiply the costs by this factor.
7. MoF budget allocations from 2013-18 in relation to GDP were 0.54 percent, 0.25 percent, 0.34 percent, 0.13 percent, 0.17 percent, and 0.20 percent, respectively. These allocations are similar to those in other countries highly dependent on donor aid (van Ginneken, Netterstrom, and Bennett 2011).

Chapter 5
What Opportunities Exist to Enhance the Effectiveness and Outcomes of the Programs?

Summary of Findings

Our findings confirm the strategic relevance of both water supply and sanitation (WSS) programs to Zambia's economy. However, neither program is structured to efficiently deliver on the service outcomes that the government seeks. Even worse, the existing sector expenditure framework does not support efficient program implementation. Although the National Urban Water Supply and Sanitation Program (NUWSSP) has better funding predictability, the National Rural Water Supply and Sanitation Program (NRWSSP) is starved of funds. Moreover, the government of the Republic of Zambia (GRZ) has insufficient fiscal space to fund both programs. Our analysis further shows that Zambia's chronically inefficient water utilities are creating a hidden fiscal burden, making it harder for the government to finance the sector.

Implications of the Findings

The earlier findings have several implications for the government's flagship WSS programs in terms of program design and implementation and financing. The results also have broader implications for advancing Zambia's WSS sector reforms and narrowing the gap between policy and practice.

Program Design and Implementation

The scope of the programs needs to be reviewed to include activities designed to enhance the institutional capacity of districts and commercial utilities (CUs) to plan, implement, and monitor the programs. Such activities must not only focus on individual staff training but also address a combination of individual competencies and collective capabilities (resources, tools, and assets) that would enable each agency/unit to perform its functions effectively and efficiently. Indicative activities may include: (a) strengthening planning processes, including the preparation of a five-year national sector investment plan (SIP) and development and dissemination of tools and guidelines for improving the quality and consistency of district annual plans with GRZ priorities as laid out in the SIP; (b) strengthening implementation capacity of sector institutions at various levels (national, provincial, district, and ward) through additional human resources (especially at the district level), streamlining of roles and accountabilities, and improving the efficiency of funds flow; and (c) strengthening monitoring and evaluation (M&E) systems for both programs to capture timely and reliable information on program activities, covering key service performance indicators, fiduciary performance indicators, and project/contract management performance indicators. In terms of implementation arrangements, the programs must be anchored within the sector institutional structure, not merely as guiding frameworks but as budget-holding programs with the necessary implementation guidelines, governance mechanisms, and clarity of roles to hold both CUs and local governments accountable for delivery.

There is a need to develop a methodology for prioritizing infrastructure investments, especially for the urban program, which appears heavily skewed toward bulk water production, with limited attention to sanitation, water distribution network improvements, and reduction of losses. In this regard, the GRZ should consider an investment policy that prioritizes investments in reducing water losses. One practical way to operationalize such a strategy would be to require CUs seeking public financing to define investment packages that balance the reduction of leakage against the development of new production sources. Furthermore, to improve public health impact, the GRZ should make use of public health data to target and prioritize WSS investments that yield the most significant reduction in public health risks. A recent study of WSS investment scenarios in Lusaka found that improving the targeting of interventions (together with optimal choice of technology) results in a higher cholera risk reduction of between 35 and 51 percent, compared with the baseline scenario (see box 5.1). There are many other examples of improved targeting and prioritization of WSS investments that the GRZ should emulate. The government of Tanzania, for example, used stunting data to develop the Tanzania Rural Water Supply and Sanitation Program-for-Results, which targets areas with high stunting rates. Haiti has an ongoing program that targets cholera hotspots around the country for WSS infrastructure investment. The need for prioritization and targeting is especially relevant for the Zambia programs, given the limited financial resources available.

BOX 5.1. Using Public Health Data for the Design and Targeting of WSS Investments: Geospatial Analysis of the 2017–18 Cholera Outbreak in Lusaka, Zambia

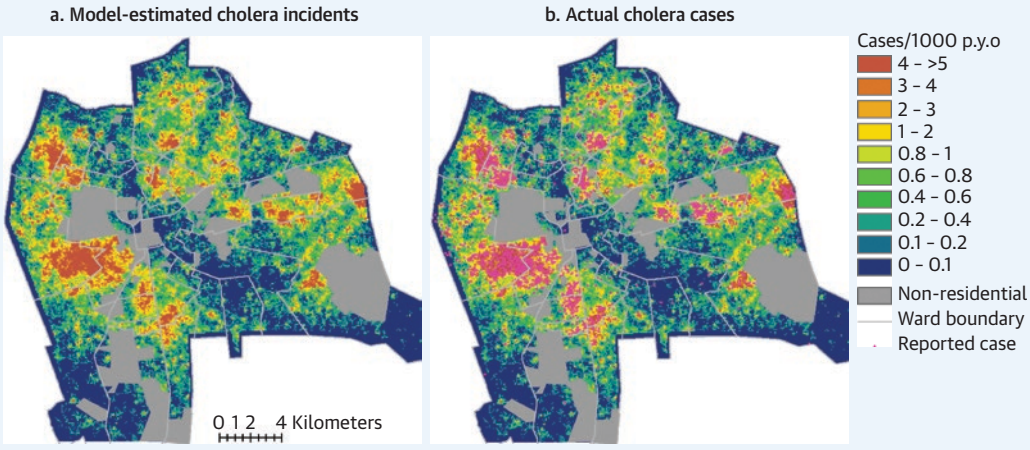
A cholera outbreak occurred in Zambia, from October 2017 to May 2018, which resulted in more than 5,000 cases and almost 100 deaths. Of these, 92 percent of cases were confined to Lusaka, the worst outbreak the city had seen since 2010. Considering the severity of the outbreak—and the known causal links among poor water, sanitation, and hygiene and cholera—Lusaka Water and Sanitation Company (LWSC) requested technical support from the World Bank to reevaluate its flagship investment, the Lusaka Sanitation Project, at midterm review with due consideration to enhancing its public health impact in terms of cholera risk reduction. The objective was to provide robust quantitative estimates using geospatial statistical techniques to compare the effects of different combinations of water supply and sanitation investments on reducing cholera risks and their relative cost-effectiveness.

A range of spatial data from different sources was gathered to include: the exact locations of the cases themselves; characteristics of households from household surveys, such as their water, sanitation, and hygiene conditions; groundwater characteristics; flood propensity and drainage channels in the city; the existing network infrastructure, such as piped network and sewer; water quality contamination; poverty levels; and satellite data on night-time lights. All this information was combined to build a geospatial risk model that would accurately reflect the distribution of cholera cases. As figure B5.1 shows, the model can predict with high level of accuracy the distribution of cases citywide.[a]

box continues next page

BOX 5.1. continued

FIGURE B5.1. Estimated cholera incidence rate for 2017–18 Cholera Outbreak in Lusaka, Zambia



A total of eight investment scenarios were analyzed, organized in two broad categories: (a) reduced scope scenarios—baseline scenario involving a reduction in the scope of sanitation investments because of cost overruns incurred on the project by the midterm—and (b) scale-up scenarios involving sanitation, water quality improvements, and increasing access to potable water supply. The impact of each investment scenario on cholera risk reduction was analyzed using the model and the corresponding costs estimated. The study found that if the scope of the Lusaka Sanitation Project is expanded and targeting of interventions improved, cholera risk in the city can be reduced by between 35 and 51 percent compared with baseline scenario (reduced scope). The findings are expected to help inform decisions on possible scale up of the project, should additional financing become available. The study showcased how the growing availability of geospatial data on water and sanitation infrastructure, environmental characteristics, and other risk factors can be coupled with spatial statistical analysis to provide granular information to support investment decision making and prioritization for maximum public health impact.

Note:
a. Correlation of 0.48, mean absolute error of 1.88, and mean error of −0.40.

Financing

A credible sector financing strategy and funding mechanism is urgently needed to address the funding shortfalls, especially on the rural program. Given that the GRZ has minimal fiscal space for new loans, a credible financing strategy for both programs must contribute to the creation of fiscal space. Such a strategy may include, for instance, mobilizing donor grants to fund the NRWSSP or combining the two programs into one and blending donor grants with concessional and nonconcessional financing. The GRZ will also need to develop coordinated and flexible funding arrangements to improve the efficiency

of external donor financing by bringing the greater share of funding on-budget through pooled financing, using sector investment plans to strengthen prioritization, traceability of funds, and reporting. Both programs need to put in place credible strategies to improve budget allocation in the national development plans (NDPs), the annual Ministry of Finance (MoF) budgets, and on predictability and control of budget spending. Both programs have well-documented costs. However, their unit costs are in the high range, especially the NRWSSP, which can affect the efficiency of expenditure. Available funding for both the NRWSSP and the NUWSSP needs to be complemented with new commitments, especially in the rural water supply and sanitation (RWSS) sector.

The policy direction for both the NRWSSP and the NUWSSP should be to promote alternative ways of financing, including basket funding and public-private partnerships (PPPs). The Devolution Trust Fund is a basket financing instrument with the aim of providing a source of additional funds for the CUs to extend their services to the urban poor. It mainly promotes the extension of public water distribution systems and on-site sanitation in low-income areas. Its intervention has benefited Zambia's poor—more than 1 million people. Although its current operation is under review, the fund could be used to bring in alternative resources. Zambia has a robust PPP legal and institutional framework that could be used to explore PPPs for major water and sanitation infrastructure.

For urban water supply, the GRZ should have a deliberate strategy to use public finance to incentivize efficiency improvements in CUs by linking financing to verifiable improvement in operational efficiency. This would improve financial performance and enable CUs to contribute to capital investments through increased cash flows. Data from the National Water Supply and Sanitation Council (NWASCO) show that average tariffs for CUs in Zambia are well above average operations and maintenance (O&M) costs and can cover some financial costs. However, high levels of losses and operational inefficiencies are preventing CUs from accessing private capital. The solutions to the efficiency challenge are known and can be prioritized based on payback period or financial parameters (see box 5.2). Therefore, any future capital injection by the GRZ in the NUWSSP must consider interventions to improve the efficiency of CUs, which would make them more creditworthy and thus increase their chances of mobilizing private capital. In short, this analysis provides overwhelming evidence to support a shift in the focus of the NUWSSP toward efficiency improvement.

Sanitation will require new public financing mechanisms that recognize the public good aspects of sanitation. Sanitation is predominantly financed by households, but this model has failed to close the access gap. Moreover, significant public investments will soon be required as people move up the sanitation ladder, especially in small towns. The ongoing Lusaka Sanitation Program is currently the only large-scale public investment in sanitation in Zambia. However, the unprecedented capital injection (US$300 million) will require a rethink of existing financing mechanisms for urban sanitation services to ensure sustainability. To start, CUs need to start accounting separately for the costs of providing sanitation services; NWASCO has already developed new sanitation regulation tools based on this. Currently, sewer services are charged at only 35 percent of the water tariff, with no clear link to the actual costs of providing the service. NWASCO has, in the past, allowed some CUs (notably the LWSC) to surcharge an additional 2.5 percent of the water bill for all customers, regardless of whether they are connected to the sewer network. The funds generated from the surcharge are used by CUs to finance

BOX 5.2. Prioritizing Water Utility Efficiency Investments

The sources of commercial utility (CU) inefficiencies are well known. These are *technical inefficiencies* (that is, physical water losses caused by leaking pipes), *commercial inefficiencies* (that is, revenue losses caused by meter inaccuracies, illegal use, unmetered consumers, and nonpayers), and or*ganizational inefficiencies* (caused by overstaffing, costly, and outdated human resources policies). The potential efficiency-improving interventions are many, ranging from lowering leakage and replacing customer meters to reducing staff costs (through the introduction of technology) and optimizing the organizational structure. The relative costs and returns from each intervention depend on the characteristic of each CU. One study (Rogers, unpublished**)** analyzed the inefficiencies in all 11 CUs in Zambia and prioritized efficiency-improving interventions with the shortest payback period. The results showed the priority interventions (with less than five years' payback period) involve introduction of technology, such as supervisory control and data acquisition systems for plant operations, automatic meter reading, and automatic metering infrastructure, to save on staff costs. Leakage reduction is surprisingly low on the priority list, partly because of the high costs associated with reconfiguring the network before leakage recovery and the fact that production cost savings are marginal because of the already low production costs in Zambia. Interestingly, meter replacement and prepaid meters, which most CUs traditionally invest in, were consistently low on the priority list. These results demonstrate that it is not always obvious which efficiency interventions make financial sense. Therefore, utility managers embarking on efficiency turnaround programs need to do their homework to determine which interventions should be prioritized based on the payback period and other financial indicators as appropriate.

WSS projects in periurban areas, as approved by NWASCO. The regulator should consider formalizing the surcharge as a public financing mechanism for the public good aspects of urban sanitation, such as maintaining trunk sewers and treatment plants. A financial analysis of the urban sanitation service chain in Lusaka showed that the surcharge is a critical part of the financing needed to make urban sanitation services financially viable for LWSC over the next 10 years, in addition to tariff increases and an aggressive efficiency improvement program (see box 5.3 for details).

Advancing Zambia's WSS Sector Reforms

These changes to program design and implementation must be complemented with medium-term actions to advance Zambia's WSS sector reforms and narrow the gap between policy and practice. Zambia's WSS reform program, which has been the envy of many countries in Africa, has yet to deliver on its promise. The critical issue remains the incomplete implementation of the reforms. There is a broad consensus on the key areas in which greater emphasis is needed:

- Strengthen corporate governance of CUs and increase managerial autonomy and accountability. Such a reform may require changes to the Water Supply and Sanitation Act of 1997 to empower the

BOX 5.3. Financial Analysis of the Urban Sanitation Service Chain in Lusaka

Lusaka Water and Sanitation Company (LWSC) is implementing the Lusaka Sanitation Program, which aims to achieve 100 percent coverage of improved sanitation services in Lusaka by 2035. The program is supported by four international financing institutions, namely the World Bank/International Development Association, African Development Bank, European Investment Bank, and German Development Bank (Kreditanstalt für Wiederaufbau). Together they are investing almost US$300 million in Lusaka's sanitation system, which covers development of both infrastructure and LWSC's capacity to manage all aspects of sanitation, from conventional sewer to on-site sanitation systems (OSS) and fecal sludge management (FSM) services. The large capital injection has raised concerns within the LWSC about the financial sustainability of the sanitation service chain in Lusaka and whether the company will be able to generate enough revenue to cover the cost of maintaining the infrastructure (including asset renewal). To facilitate dialogue between LWSC and policy makers (including the National Water Supply and Sanitation Council [NWASCO]), the World Bank developed an Excel-based financial modeling tool to analyze the financial flows for the urban sanitation service chain in Lusaka for 2018–30. The analysis set out to answer the following key questions, relevant to the ongoing urban sanitation financing policy discussions in Lusaka: (a) What is the projected cost of providing urban sanitation and water services in Lusaka in the short and medium term? (b) Is there a cost recovery gap, and if so, what options can be implemented to reduce it? and (c) Which combinations of options can ensure sustainability?

The financial analysis revealed the following: (a) Sewer services will remain financially unsustainable at the current sewer charge of 35 percent of the water tariff, even if a 3.5 percent real increase in water supply tariffs is implemented; (b) the current sanitation surcharge of 2.5 percent of the water tariff may be enough to cover the costs of FSM services (including operation of the fecal sludge treatment plant). However, construction of about 5,000 new OSS units per year is required to keep up with population growth over the next 10 years. Given affordability constraints within the OSS customer base, the LWSC will require additional grant funding to support the OSS business beyond the project; and c) financial sustainability (operations and maintenance only) of the sanitation services (sewer and OSS/FSM) will require a sanitation tariff of 75 percent of the water supply tariff (assuming 3.5 percent real increase per year). This reflects the significant underutilization of the sewer assets. However, at this level, sanitation services are no longer affordable. The findings suggest that the LWSC's sanitation services are unlikely to be financially sustainable on their own in the next 10 years. For this reason, a consolidated financial analysis was undertaken to determine the combination of measures needed to achieve financial sustainability (including debt service) of LWSC's combined services (that is, water, sewer, and OSS/FSM) over the next 10 years. The consolidated analysis showed that financial sustainability can be obtained with a combination of the following: (a) reducing nonrevenue water from 45 to 35 percent; (b) increasing revenue collection efficiency from 80 to 90 percent; (c) 5 percent annual real increases in water tariffs; (c) increasing the sanitation surcharge from 2.5 to 15 percent of the water tariff; and (d) 5 percent annual cost efficiency improvements. These results demonstrate that sanitation surcharges are an integral part of the financing needed to make sanitation services viable in Lusaka in addition to an aggressive efficiency improvement program, which previous studies show is feasible in the LWSC.

shareholders of CUs (local authorities) and introduce mixed ownership (public and private)—all aimed at reducing the risk of arbitrary central government interventions in the management of utilities.

- Strengthen the policy role of the Ministry of Water Development, Sanitation, and Environmental Protection (MWDSEP) by linking public financing to policy and service delivery goals that the GRZ seeks to achieve at the local level.
- Rethink existing community management models for water supply services in rural areas and get better data on actual implementation and O&M to modify the current models.
- Urgent intervention is needed to strengthen M&E, mainly in the rural sector.
- New reforms are urgently needed to unlock sector finance, with efficiency improvements in CUs taking center stage. There is also a need to establish and institutionalize public financing mechanisms for sanitation that recognize the public good aspects of sanitation (such as the use of a sanitation surcharge for all water consumers).

Finally, the government will need to address broader public sector governance constraints, particularly the slow pace of decentralization and the low capacity at the district level—a key obstacle for NRWSSP implementation. Although this challenge is not unique to WSS, the sector can provide an entry point to advance the decentralization agenda through instruments, such as intergovernmental transfers earmarked for water and sanitation and performance agreements between the MWDSEP and districts or CUs and improved delivery of essential WSS services. It is also recommended to expand the mandate of CUs to cover rural areas, as much as possible, to reduce the demand on capacity-constrained districts.

In conclusion, water supply and sanitation are important economic development issues for Zambia, but progress has remained static despite the efforts of the government and others. Decades of reform and government programs are failing to deliver on their promise, and time is running out. Although major public health crises, such as the recent cholera outbreaks, make the news, there is a more silent crisis hidden away from the headlines—the millions of stunted children in Zambia who are never going to realize their full potential. Inadequate WSS provision is partly responsible. This study has proposed evidence-based actions that the GRZ can take to enhance the effectiveness and outcomes of its investment programs. The proposed changes do not require any radical change in policy or implementation arrangements but do need some hard decisions on roles and responsibilities and an increased focus on the efficiency of CUs to close the investment financing gap. If the GRZ accepts these proposals, the performance of the programs is likely to improve. On the other hand, if no action is taken, then Zambia has little chance of breaking out of the cycle of low investment and low levels of access to water and sanitation services.

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Appendix A
Hidden Cost of Inefficiencies in Zambia's Water Utilities

Introduction: The CUs in Zambia

Zambia's water supply and sanitation (WSS) regulatory agency has consolidated its powers to enable commercial utilities (CUs) to improve service provision. The Water Supply and Sanitation Act No. 28, 1997, provided the legal framework for local authorities to establish their CUs as vehicles to provide WSS services to their citizens. It also established the National Water Supply and Sanitation Council (NWASCO) as an independent regulatory agency to ensure the financial viability of the CUs while guaranteeing good quality of services to final customers. Thus, since the early 2000s, NWASCO has provided a framework to enable CUs to achieve financial viability by using various regulatory mechanisms, including tariff approvals based on the review of each CU's operations and maintenance costs and benchmark "competition" to promote improvements in operating efficiency.

Information collected by NWASCO from CUs presents a unique opportunity to assess hidden costs in the Zambian urban WSS sector. Since 2001, NWASCO has been collecting data from licensed CUs in three main areas: quality of service, economic efficiency, and operation sustainability. Based on the study of such submitted information, NWASCO approves requests for tariff increases for the CUs.

Outline Methodology for the Assessment of Hidden Costs

There is a well-tested methodology to assess hidden cost in utility sectors, including WSS. The method to determine the magnitude of hidden costs has been presented by Ebinger in a World Bank Policy Research paper to evaluate the financial performance of electricity and water utilities in Eastern Europe and Central Asia (2006). The article suggests that there are three primary sources of unintended subsidies/costs that can be assessed by information readily available in regulatory agencies:

1. Tariffs set below cost-recovery rates: If the average tariff approved by NWASCO for the CU is lower than its average cost, then the difference is a hidden cost that someone will need to pay.
2. Excessive losses as a result of inefficient operations or theft from the networks: If the CU produces bulk water supply and its losses (nonrevenue water [NRW]) is too high compared with normal losses (NWASCO sets this at 25 percent), then the costs of the excess loss is a hidden cost that someone will need to pay.
3. Poor bill collection rates: If a CU issues bills to customers and they don't pay their bills, then nonpaid bills are hidden costs to the CU that someone else will need to pay for the CU to operate and maintain its facilities.

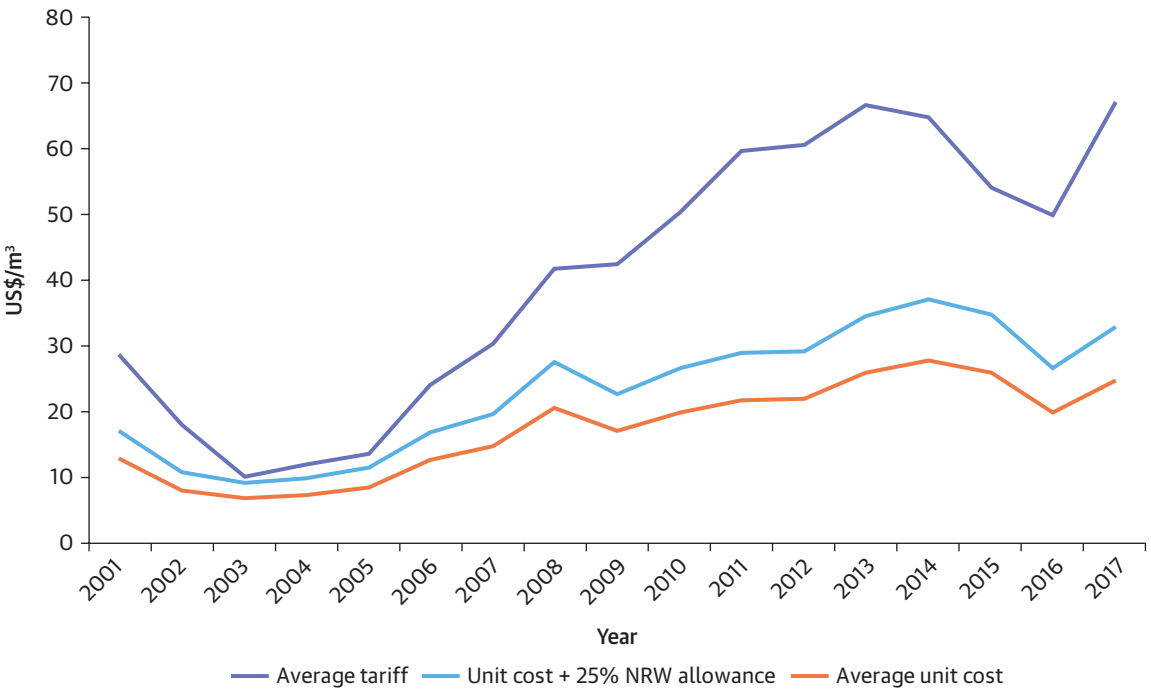
Detailed formulas for the estimation of the hidden costs in the urban WSS sector in Zambia, adapted from Ebinger's paper, is presented in appendix B.

Hidden Costs Resulting from Tariffs Set below the Unit Cost of Production

There are no hidden costs resulting from tariffs set below costs of production, as seen in the analysis of tariffs as compared with average operations and maintenance (O&M) costs. That is, year after year, since the establishment of the CU system in Zambia, tariffs for each utility was set to cover at least O&M costs including an allowance for normal NRW; and beginning in 2011, NWASCO has awarded tariff increases to cover portions of financial costs of loans used to fund infrastructure projects in the CUs' service areas (see figure A.1).

Average tariffs for CUs in Zambia are well above average O&M costs (unit costs) and can cover some financial costs. The tariffs (US$ per cubic meter), plotted in figure A.1 for each year from 2001 to 2017, are the weighted average of tariffs approved by NWASCO for each of the 11 water utilities with license to operate. Similarly, the average unit costs are estimated as weighted averages. We also include in figure A.1 the unit cost plus an allowance to cover 25 percent of normal losses. According to information in figure A.1, the most challenging time for CUs must have been 2001 to 2005, when NWASCO was establishing the culture of tariff approval based on information submitted by CUs. After 2005, increases in average tariffs for CUs were higher than increases in O&M costs—for example, between 2005 and 2017, the average annual increase in tariffs was 14 percent, whereas the corresponding yearly increase in average costs was 9 percent. From conversations with NWASCO senior staff, CUs have tariffs approved that can cover

FIGURE A.1. CUs' Average Tariffs and Average Unit Costs



Source: PEM Consult estimates, prepared with info from NWASCO.
Note: NRW = nonrevenue water; NWASCO = National Water Supply and Sanitation Council.

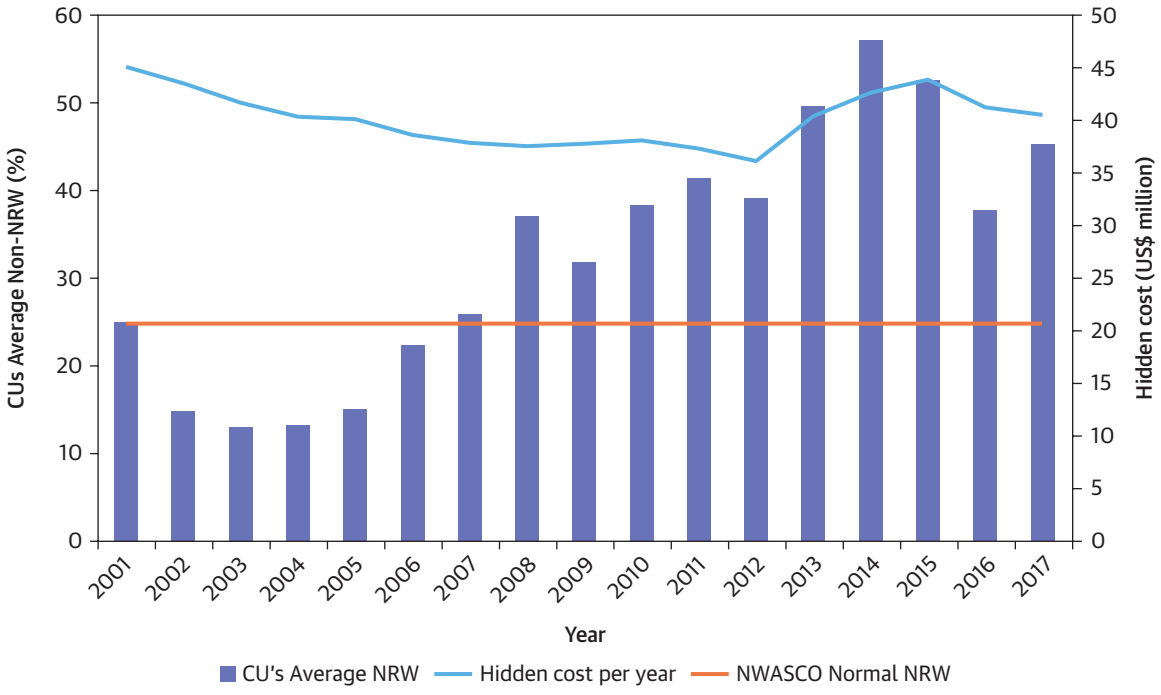
their financial obligations—that is, full-cost recovery tariffs—and figure A.1 shows that average tariffs are more than double the corresponding average costs. However, the actual high levels of NRW (as described in the next section) may be preventing CUs from generating the cash to comply with their financial obligations.

The average tariff and unit costs of production went down during 2014–16, mainly because of kwacha depreciation. Average tariffs in U.S. dollars went down 17 percent, 21 percent, and 42 percent during 2014, 2015, and 2016, respectively. During 2017, there was a revaluation (14 percent) accompanied by tariff increases of 18 percent (in kwacha); both together push tariffs up by 34.5 percent (that is, 1.14×1.18 −1 = .345). Also in 2017, there was a cost escalation of about 24 percent, which might have been used as a justification to get the tariff a 34 percent increase.

Hidden Costs Resulting from NRW above NWASCO's Normal

CUs have seen their NRW worsen over the past five years. As seen in the analysis, the CUs' average NRW has experienced a trend of improvements over the first 12 years. During this period, NRW went from 54 percent in 2001 down to 43 percent in 2012; however, it escalated back to 52 percent in 2015 and went down to just less than 50 percent in 2017 (see figure A.2). NRW is one of the biggest challenges of the CU system in Zambia.

FIGURE A.2. Hidden Costs Attributable to High NRW



Source: PEM Consult estimates, prepared with info from NWASCO.
Note: CU = commercial utilities; NRW = nonrevenue water; NWASCO = National Water Supply and Sanitation Council.

Hidden costs from high levels of NRW are about US$464 million when no capital costs are included in the costs of production of CUs. However, NWASCO has been gradually implementing full-cost recovery policies to set tariffs under the reality that CUs were being requested to pay back loans used to finance their infrastructure development. To estimate total unit costs of production per utility, the financial obligations per year of each utility derived from the loans used to finance their investment programs should be used.

Hidden costs from high levels of NRW are about US$629 million when some capital costs are included in the cost of production of CUs. A first attempt to estimate such full unit costs is made using the investment figures per utility included in the National Urban Water Supply and Sanitation Program (NUWSSP). The NUWSSP was started in 2011, and since then, CUs were getting joint obligations (along with the Ministry of Finance [MoF]) to pay back loans to lenders. As such, NWASCO granted CUs, as part of their tariffs, the revenue required for complying with their debt obligations—that is, from the perspective of CUs, their total unit costs are the sum of the per cubic meter O&M costs plus the per cubic meter costs of the financial obligations. Thus, an estimate was done of "full unit costs" per utility, based on annual figures in the NUWSSP investment plan for 2011-15; 2016-17 was not included because the NUWSSP does not include yearly investment figures for the period 2016-20. Based on this, the estimated hidden cost to the Zambian economy, because of NRW above-normal losses, is about US$629 million, of which US$432 million happened during 2011-15.

Hidden Costs Resulting from CUs Low Collection Efficiency

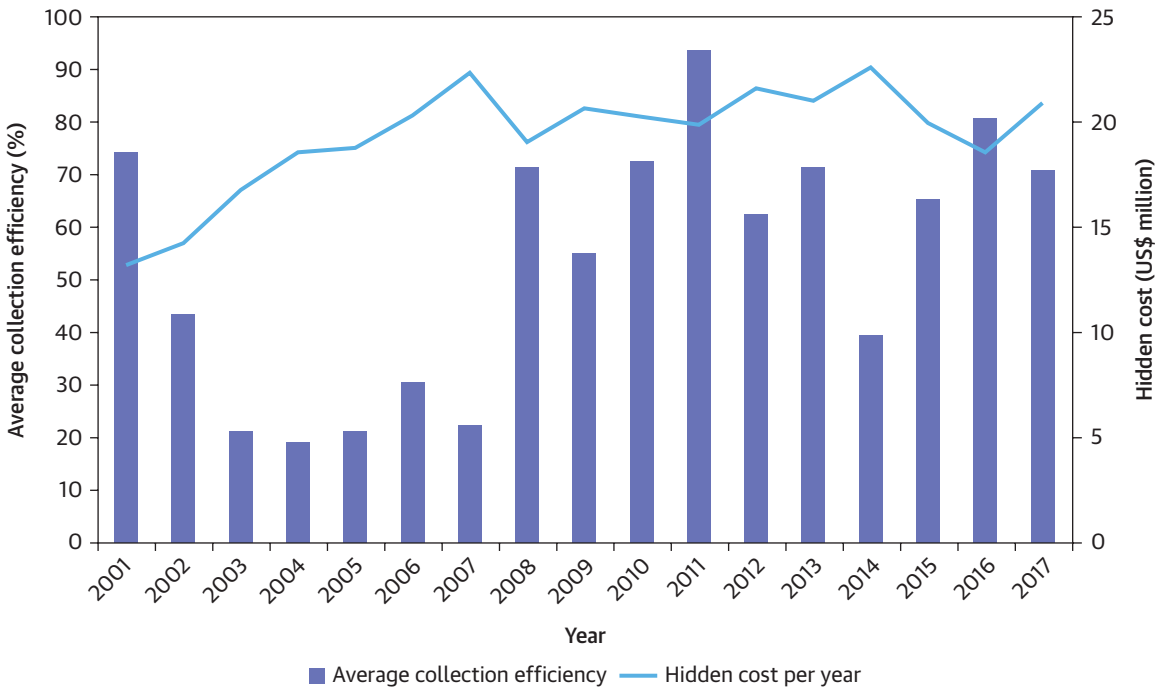
Collection efficiency has worsened during the past four years. As seen in the analysis, the weighted average collection efficiency per year improved significantly in the first seven years, going from about 52 percent in 2001 up to 90 percent in 2007. After that, collection efficiency went down more than 10 points in 2008, and since then, it gradually recovered until 2014 before it fell again to about 75 percent in 2016. In 2017, it improved to higher than 80 percent, which is still well below the 90 percent once achieved (see figure A.3).

The estimates of hidden costs attributable to low collection efficiencies can be seen in figure A.3. As collection efficiency improved over the first seven years, hidden costs went down from about US$18 million to about US$5 million per year. After that, hidden costs attributable to low collection efficiencies (and higher tariffs) went up to US$24 million per year in 2011. Overall, from 2001-17, hidden costs attributable to low collection efficiency are estimated to be US$229 million, of which US$121 million happened from 2011-17.

Conclusion

High levels of CUs' NRW and low collection rates have imposed on the Zambian economy costs estimated to be US$858 million. Of this, US$629 million was caused by high volumes of NRW and US$229 million was caused by low collection efficiency, as summarized in table A.1. In relation to gross domestic product (GDP), CUs' hidden costs varied from 1 percent in 2001 to 0.5 percent in 2015. Also, in absolute terms,

FIGURE A.3. Hidden Cost Attributable to Low Collection Efficiency



Source: PEM Consult estimates, prepared with info from NWASCO.

TABLE A.1. Estimated Hidden Cost in the Zambian CU System (US$ million)

	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	Total
Total hidden cost	39.4	23.3	16.1	15.7	17.9	26.1	27.1	48.5	40.3	50.0	62.6	58.2	77.4	85.7	95.7	85.4	88.5	858.0
from high NRW	20.8	12.4	10.8	10.9	12.6	18.5	21.5	30.7	26.5	31.9	39.2	42.6	59.5	75.8	79.4	65.2	70.8	628.8
from low collection	18.6	10.9	5.3	4.8	5.3	7.6	5.6	17.9	13.8	18.2	23.5	15.6	17.9	9.9	16.3	20.2	17.7	229.2
CU hidden cost/GDP (%)	1.0	0.6	0.3	0.3	0.2	0.2	0.2	0.3	0.3	0.2	0.3	0.2	0.3	0.3	0.5	0.4	0.3	-

Source: PEM Consult, estimated with information from NWASCO.
Note: CU = commercial utility; GDP = gross domestic product; NRW = nonrevenue water; NWASCO = National Water Supply and Sanitation Council.

most of the losses occurred during the past seven years (US$554 million) and was equivalent to about 20 percent of the total capital so far invested in the NUWSSP. Therefore, given that CUs are the primary providers of WSS services in Zambia, any significant capital injection in the sector must also consider interventions to improve the efficiency of the CUs.

Appendix B
Hidden Cost Methodologies

Formulae for the Estimation of Hidden Costs in the Urban WSS Sector

The equation (B.1) estimates total hidden costs of all commercial utilities (CUs) during each year:

$$HC^{t} = \sum_{i=1}^{11} HC^{i,t} \tag{B.1}$$

Where:

- HC^{t}: Total hidden costs of all utilities during year "t"
- $HC^{i,t}$: Hidden cost utility "i" during year "t"

The equation (B.2) estimates hidden cost for each utility each year:

$$HC^{i,t} = HC^{i,t}_{\text{tariffs set below cost recovery}} + HC^{i,t}_{\text{NRW above normal}} + HC^{i,t}_{\text{poor collection efficiency}} \tag{B.2}$$

The estimation of each summand in the Right Hand Side of equation (B.2) is as follows:
The equation (B.3) estimates total hidden costs as a result of tariffs lower than cost recovery:

$$HC^{t}_{\text{tariffs set below cost recovery}} = \sum_{i=1}^{11} Q_e^{i,t}\left(T_c^{i,t} - T_e^{i,t}\right) \tag{B.3}$$

Where:

- $Q_e^{i,t}$: Utility "i" sales during year "t"
- $T_c^{i,t}$: Utility "i" unit cost of production during year "t," operations and maintenance (O&M) + reasonable allowance for investment (sometimes such allowance is estimated using long-run marginal cost approach)
- $T_e^{i,t}$: Utility "i" weighted average end user tariff during year "t"

The equation (B.4) estimates total hidden cost as a result of nonrevenue water (NRW) above normal losses:

$$HC^{t}_{\text{NRW above normal}} = \sum_{i=1}^{11} \frac{Q_e^{i,t} T_c^{i,t}\left(NRWrate^{i,t}_{actual} - \text{NRWrate}^{\text{i,t}}_{\text{normal}}\right)}{1 - \text{NRWrate}^{\text{i,t}}_{\text{actual}}} \tag{B.4}$$

Where:

- $NRWrate^{i,t}_{actual}$: NRW in utility "i" during year "t"
- $\text{NRWrate}^{\text{i,t}}_{\text{normal}}$: Normal NRW in utility "i" during year "t." The National Water Supply and Sanitation Council (NWASCO) has set this parameter at 0.25 (25 percent) for all utilities.

The equation (B.5) estimates total hidden cost as a result of poor collection efficiency:

$$HC^{t}_{Low\ collection\ efficiency} = \sum_{i=1}^{11} Q_e^{i,t} T_e^{i,t} \left(1 - CE^{i,t}\right) \quad \text{(B.5)}$$

Where:

- $CE^{i,t}$: is collection efficiency of utility "i" during year "t"

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